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Beginning the Winter's Work.

WITHIN a few days we shall have passed from the gloom of "Summer-time" to the brightness and warmth of the winter. The enterprising controllers of E.D.A.'s proceedings have not waited for the change-over in arranging the opening conference for the new session, for the first of the gatherings of the London Area takes place on Friday, September 30th. Very appropriately the meeting will be devoted to an address on The Circle Campaign by Mr. V. W. Dale, the Business Manager of the Association. We hope that the Society of Arts Hall in John Street, Adelphi, will be well filled at 7.30 p.m. on that date by men and women who are really interested in the new campaign, and that as a result of the proceedings everybody will go away determined to do his or her own "bit" to ensure the success of the movement. If we may say so, it should not be necessary on this occasion for the opener of the discussion to occupy quite so long in introducing the subject as was considered requisite when opening the London part of the W.O.B. Campaign nearly a year ago. Our readers are already familiar with the general plan of the Circle Campaign (ELEC. REV., July 29th, pp. 170 and 179), though, of course, there are many details which can be explained in speech better than in literature. But when once the matter has been fittingly introduced, there should be time for at least an hour's profitable debate.

The opening discussion a year ago did not reach a very high standard, perhaps because it seemed to be more or less forced. The situation has been so greatly changed as the result of last winter's activities all over the country that the men and women connected with the selling side of the industry ought to be bubbling over with useful information and suggestions which will stimulate still greater interest and general enthusiasm. We believe it is well understood by now that anybody and everybody electrical is invited to the E.D.A. Conferences and that there are no fees. The full list of London arrangements for the session appears in our "Business Notices" to-day.

It is satisfactory to know that though the working programmes of the Circle Campaign had to be circulated

during the holiday season, there has been a splendid response to the appeal for co-operation. May this interest be not only well sustained, but rapidly spread during the next few months. The Campaign formally opens with the various luncheons which are to take place in different parts of the country on Monday, October 3rd, at 1 o'clock. They will be organised by local groups of electrical enterprising spirits with the object of securing in the aggregate a great propaganda effect among those who direct and form opinion through the newspaper Press. The London luncheon will be addressed by Sir James Devonshire, the President of the British Electrical Development Association, and a member of the Electricity Board, who may have a message to deliver which will be of special interest in connection with the electricity supply situation which is developing in the London area.

Experience has shown that it is not very easy to prepare electrical propaganda speeches which will satisfy all tastes and requirements. Naturally enough a statement that will provide attractive copy for the average newspaper man to pass on in popular form and style to the general public—which really is our main objective—may leave other men unmoved or apathetic, or else grumbling that nothing new has been said and that the old truths have not been expressed with contagious enthusiasm. Of some of the speeches at E.D.A. public functions in the past, critics have said that they were deadly dull, and that great opportunities had been missed. If this was so—and we do not say that the criticism was altogether uncalled for—we should do well to profit by past experience. There is surely no lack of useful electrical information of an attractive kind, nor is there any uncertainty concerning the grounds on which the appeal to the people is based. We trust therefore that in London and every other centre where campaign speeches are delivered on October 3rd, our orators will so hold the interest of their Press audiences that there will be no doubt about a substantial effect being ultimately produced upon the mind of the newspaper reader.

Our Foreign Electrical Trade.

It will be seen from the statistics of British foreign electrical trade which we publish in this issue that an improvement in exports occurred during August, both as compared with the preceding month and with August, 1926. Only on two occasions this year have the monthly totals fallen below the corresponding figures for 1926, and the net result so far this year is an increase of £1,309,254, representing almost a month's value.

The principal increase has occurred in unenumerated electrical machinery, the value of which has advanced by £485,505. The insulated and non-submarine cable classes have together risen by £318,043. Motors and generators (including traction motors) record an increase of £278,297, and unenumerated electrical goods one of £270,654. Only one important class has shown a decrease, *i.e.*, telegraph and telephone instruments and apparatus, which has fallen by £350,217.

All classes of imports have shown a fairly consistent rise, and the increase during the year has been the substantial one of £541,126.

Germany's Foreign Electrical Trade.

Three factors are mentioned in the German Press as unfavourably influencing the export trade of electrical manufactures from that country in the first half of this year. In the first place, the favourable situation of the inland market rendered it necessary to restrict exports and at the same time increase imports. Secondly, serious depression prevailed in certain important markets as, for instance, Japan, Italy, and Norway, owing mainly to the currency and credit crisis; and in the third place, the export trade was difficult in consequence of the great efforts made by the British electrical industry to recover the ground lost during the coal strike.

Excluding machines, the electrical exports from Germany in 1926 amounted to 92,223 tons of the value of 298,197,000 marks, whereas the imports reached 2,322 tons, of the value of 15,324,000 marks. The exports in the first half of 1927 were 40,202 tons of 139,762,000 marks value, the imports having been 1,699 tons, valued at 8,921,000 marks. While various countries increased their imports from Germany in the first half of this year, others reduced their purchases from that source. The largest share in the exports this year has been taken by apparatus for lighting, the transmission of power, and electrolysis, the value being 36,472,000 marks; the second place is occupied by wireless apparatus of the value of 18,024,000 marks, of which 25 per cent. was sent to England. The exports of cables amounted to 17,705,000 marks, of which Holland received 26 per cent.; telephone apparatus exports were 10,855,000 marks, of which Italy absorbed 23 per cent.; while measuring apparatus and meters amounted to 15,961,000 marks, Italy taking 12 per cent.

The Public Lighting Conference.

The Annual Conference of the Institution of Public Lighting Engineers, held at Brighton last week, was well attended, not only by public lighting engineers, but also by representatives of other bodies interested in street lighting, who took a prominent part in the discussion. About 24 firms this year took part in the Exhibition of Lighting Appliances, at which there was a representative display of street lighting lamps and fittings, though exhibits by firms in the electrical industry predominated; street lanterns naturally formed the chief feature of the display, but it is significant that quite a variety of special warning lamps, direction signs, and luminous traffic-control indicators were on view. On this occasion ample opportunities were provided for viewing the exhibits, the arrangements showing a marked improvement over those at the last conference.

Following Mr. Cramb's presidential address, to which we referred last week, three papers were read. A paper introducing the B.E.S.A. "Standard Specification for Street Lighting" is abstracted elsewhere in this issue. Mr. J. Christie described the street lighting of Brighton, and Mr. R. L. Matthews dealt with "Street Lighting and Traffic Problems as seen by a Chief Constable."

Most of the paper introducing the street-lighting specification was devoted to an exposition of the principles underlying the method of estimating glare, which forms the subject of an appendix to the specification. In the course of the discussion Mr. Waldram exhibited some photographs illustrating the effect of road-surface, *e.g.*, when wet or shiny, and it was pointed out by others that this consideration materially affected the proposed method of determining glare. It was also argued that the formulæ, being based on candle-power and not on intrinsic brightness, would be apt to discourage the use of diffusing glassware, and that in practice lanterns of this kind were undoubtedly much less glaring than a bare filament. Mr. Colquhoon singled out the minimum height of 13 ft. as one of the most important points. The cost of raising the height of existing lamps from 11½ to 13 ft. would work out to 10s. or 15s. per standard, but he was prepared to recommend the change. Mr. Haydn T. Harrison referred to the important influence of road surface; the modern dark tarred surfaces appear under-lighted as compared with macadamised roads. Mr. Gaster made the useful suggestion that sections of streets should be lighted strictly in accordance with the specification, so that public lighting engineers could judge for themselves the effect, and the cost.

The proceedings were fully reported in the local Press, and there is no doubt that these annual conferences in different cities serve a useful purpose, both in educating public-lighting engineers, and in drawing public attention to the importance of good street lighting.

Rural Electric Lines.—V. (*contd.*)

A Symposium of the opinions of electrical engineers experienced in the construction of overhead lines in rural areas, with examples of methods that have been, or are to be, adopted for the distribution of electricity at low and medium pressures.

The Economical Distribution of Electrical Energy in Rural Areas.

By J. T. H. LEGGE.

(*Concluded from page* 453.)

REGARDING question (1), the preparation of special ordnance maps as called for by the Commissioners for submission in conjunction with this form seems unnecessarily elaborate and costly. Why should not the customary white prints, issued in connection with the statutory notices served on the local authorities, suffice for the Commissioners instead of the submission of costly and sometimes out-of-date ordnance maps? And why the necessity of filling in hundreds of El. C. 34 forms per annum, provided an undertaking is given that the lines will be erected in accordance with constructional details previously approved by the Electricity Commissioners? The help of the Electricity Commissioners and other authorities is required by the electricity supply industry to remove difficulties that impede progress in rural distribution. In particular, some very necessary modifications of the powers of the Post Office Authorities are called for.

Take G.P.O. Memorandum No. T.E. 80, paragraphs (6) and (8) as examples. They are as follows:—

(6) In all cases, *i.e.*, irrespective of the pressure of the power circuit, a clearance of 4 feet is required, except at points where it will be difficult or costly to provide more than 3 feet, in which case the latter will be agreed to (if the Post Office line is not fully developed, additional clearance may be necessary at the outset to provide for the ultimate conditions).

(8) When the necessity for protection arises from the erection of telegraphs, *i.e.*, when the Postal Authorities' lines are erected after those of the Electric Supply Authority, the Postmaster-General, as a concession, will bear the cost of any fuse and heat coils installed, and also half the cost of the most economical method of guarding, having regard to the ultimate conditions, but in all other cases the whole cost of protection falls upon the Electric Supply Undertaking.

With regard to paragraph (6), I suggest that the clearance between the Post Office and electricity supply distribution lines be reduced to 2 feet, and where this is impracticable, the electricity supply lines to consist of P.B.J. wire, giving a minimum clearance of 6 in. With regard to paragraph (8), the position which arises when the Post Office Authorities are "second comers" is so obviously unfair that the Regulation requires completely redrafting. No authorised electricity supply undertaking should be liable to expenditure in this way. The practice of running from one side of the road to another, crossing many times in quite a short distance, as is practised generally by the G.P.O. on winding roads, should not be allowed. In many cases this altogether kills the practicability of an overhead distribution system for electricity supply being erected along the public highway, and, when considered in conjunction with the Postmaster-General's present powers, above referred to, on the matter of cost of guarding his property, this practice is often sufficient to entirely stop electrical development in many villages.

Overhead Distribution Lines at Pressures in the Neighbourhood of 3,000 Volts.

It is becoming increasingly apparent that, in connection with the supply of electricity to individual farms and hamlets, power lines conveying energy at the above pressure, fed from 11,000-V or higher-pressure lines, will be required, for the reason that tappings for such farms and hamlets have to be carried out as cheaply as possible, and the lines have to meander from farm to farm in their course. The consumption of energy per mile with this class of consumer is very low and, consequently the capital cost of the lines to reach them must be correspondingly cheap.

It is not possible to erect lines under the present Regulations, and still make the supplies for this class of business commercially feasible. Some equally drastic modifications of the Regulations (in particular Clauses 14 and 15 of El. C. 39) in connection with the construction of such lines are, therefore, required. Such modifications should take the form of making it permissible to use much longer spans with small size conductors, and smaller poles than the present Regulations call for. In short, a reduction of the factors of safety from the present extraordinarily high figures at which these are set will have to be allowed. I believe the Authorities have already had put before them a scheme for the construction of lines in the manner above indicated, the lessened factor of safety being compensated for by an arrangement of the conductors which provides that the lines become short-circuited automatically should they fall.

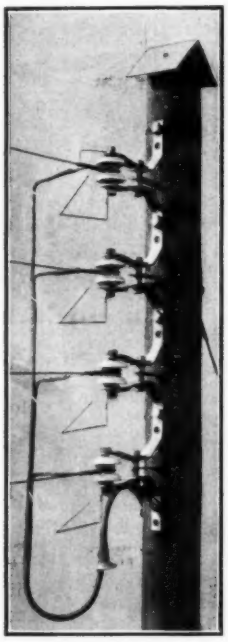


Fig. 4.—"Unit" Type of Support.

Having given views of what I consider necessary modifications of the existing Regulations, if there is to be a wide expansion of electricity supply to villages, hamlets and farms, I would give some particulars of what I have found, as a result of some considerable experience in developing rural electricity supply, to be a desirable standard of overhead work.

The design of the standardised distribution line for 400/230 volts, 3-phase supply, was the result of considerable experiment, and in adopting the methods of construction, the principal points that had to be borne in mind and the methods adopted to meet these points are outlined below:—

(1) The elimination of unsatisfactory brackets of the swan-neck variety and the substitution and standardisation of a mechanically sound "unit" type of support adaptable to 2, 3, 4, or more lines. This standard unit is shown in figs. 4, 5, 6 and 7.

(2) The necessity of a design capable of easy duplica-

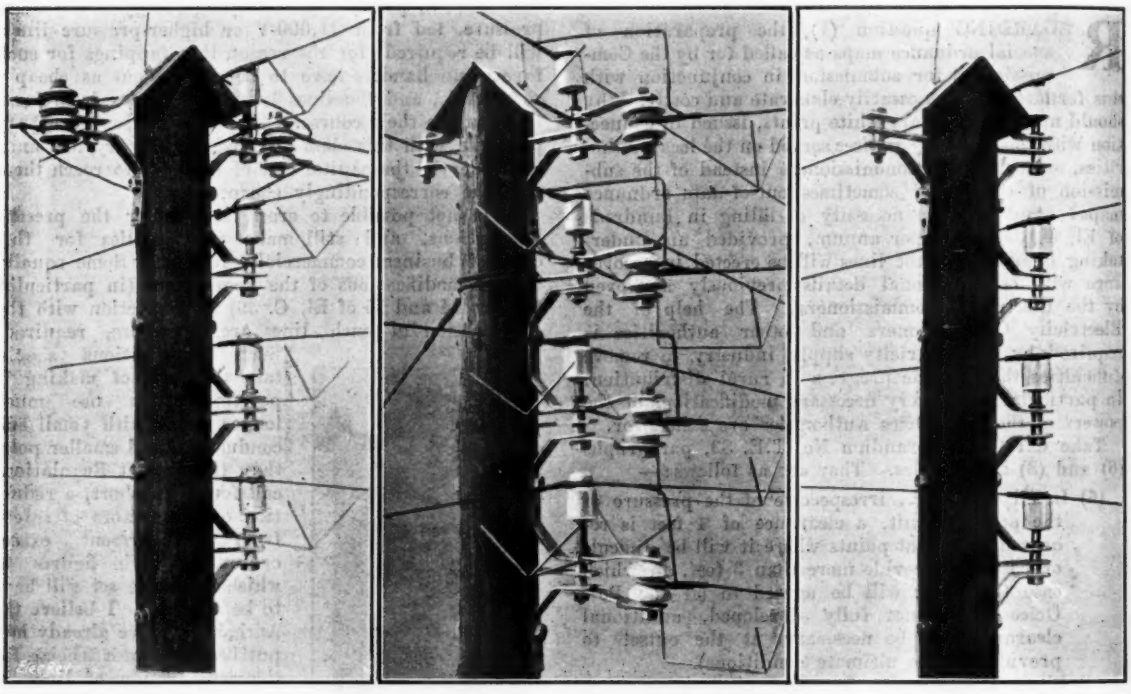
tion, when necessary, either for feeding purposes or additional distribution purposes.

(3) The elimination of special labour in fitting poles; this is met by delivering the poles already drilled and slotted, the brackets being bolted direct on to the poles.

(4) The utilisation of the full length of the pole; this is achieved by means of a pole top bracket enabling 30-ft. poles to be used for 4-wire 7/.097 distribution lines with spans of 40 yards.

(5) Simplicity of construction: the adoption of the principle of vertical stringing as illustrated in figs. 4, 5, 6, and 7 is undoubtedly an advance in this direction. The constructional and other advantages thus obtained are: (*a*) accessibility; (*b*) uniformity of sag of line wires; (*c*) crossing of conductors of opposite polarity avoided; (*d*) ease of service; (*e*) neatness of appearance; (*f*) one side of the poles is clear for duplication if at any time required, and (*g*) lines can be teed off or crossed at any angle without extra fittings being required.

(6) Facility for connecting services: in the lines illustrated is incorporated a "service strap" fitting, whereby, in order to run a service, all that is necessary is to reverse the strap, fit two reel insulators, two distance pieces and one galvanised bolt and nut. By inserting additional straps the number of services per pole can be increased. In actual practice it is found that rarely are more than four services required per pole.



Figs. 5, 6 and 7.– Standard "Unit" Type of Support.

Fig. 7 shows a line pole as it would appear if the guarding Regulations were amended as recommended, clearly depicting the "unit" type of fitting, and the straps ready to receive service insulators for supplying individual consumers.

General.

Under the section of the 1919 Electricity Supply Act dealing with wayleaves, land covered by buildings or used as a garden or pleasure ground is definitely excluded from the provisions for the acquiring of compulsory wayleaves. In view of the fact that adequate safeguards to property owners are provided by the section, it is regrettable that such a useful clause should be so circumscribed. It is often desirable to cross, or even to attach wires to, buildings when laying out a distribution system in villages and hamlets, especially when narrow streets preclude the use of pole supports.

With both high- and low-pressure lines it is sometimes necessary to cross a garden with wires, even though the route is planned to avoid, wherever possible, placing the actual pole or tower support in such garden land.

This condition should be remedied, maintaining, of course, the safeguards to the property owner, especially as the terms "garden" and "pleasure ground" can be very widely interpreted.

In spite of the foregoing disabilities to rural electrification development, a number of supply authorities have made some headway, and I am confident that, as more undertakings enter into this question of supply over wider areas, these disabilities will become more fully recognised. Without doubt, the only way to accelerate rural electrical development is to modify the existing Regulations, and this more particularly applies to distribution at pressures for direct supply to consumers.

[CORRECTION.—An error occurred in the article by Mr. W. Fennell, on p. 414 of our issue of September 9th. In the table, under the headings "Single-phase," "To Regulations," item (*a*) should read "Cost of switchgear and pole sub." £60 instead of £660, and the total should be £1,280, not £1,880.]

Electric Power in Industry.

Preliminary Report No. 22 upon the 1924 Census of Production (*Board of Trade Journal*, September 15th) shows that in the non-ferrous metal trades (smelting, rolling, and casting) there was 39,020 kW of electric generating plant, as compared with 6,297 kW in 1907. The total capacity of motors installed was 51,764 h.p., power for 34,068 h.p. of which was purchased. The finished brass trades produced electric lighting accessories valued at £482,000 during 1924. The capacity of generating plant installed was 886 kW (against 649 kW in 1907). There were 17,714 h.p. of electric motors, power for 16,071 h.p. of which was purchased. The watch- and clock-making trades had 78 kW of generating plant and 606 h.p. of motors.

Armoured Concrete Poles.

A comparison between the use of wood and concrete poles for electricity distribution lines, with some examples of Continental practice with the latter.

By THEODORE RICH.

IT is somewhat strange that in Great Britain, a country practically devoid of timber suitable for use as telegraph and power line poles, wood poles should be the rule; and that in France, Germany, and to a lesser extent in Austria and Switzerland, where forests abound, so many armoured concrete poles are to

Fig. 1.—Rectangular Concrete Pole.

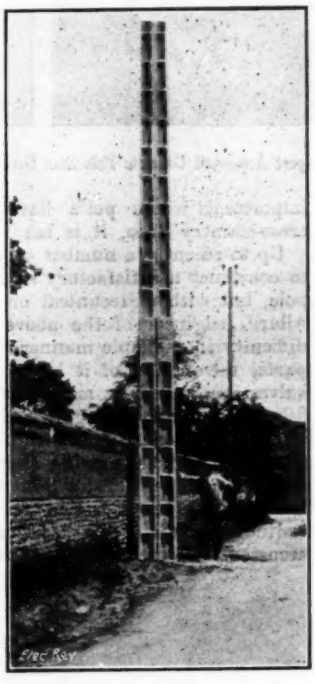


Fig. 2.—A Double Concrete Pole.

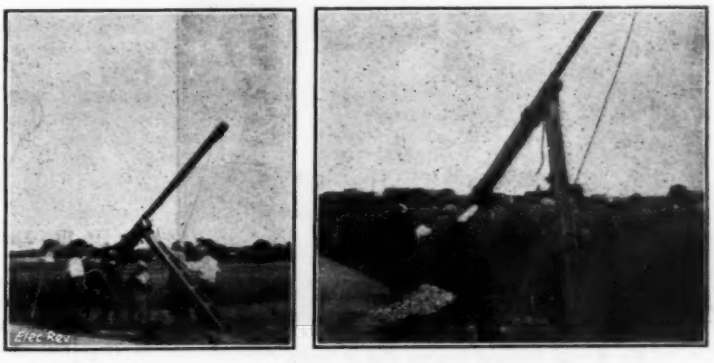
be seen. Apart from a certain number of signal poles which are to be found on our railways, the use of armoured concrete for such purposes is practically unknown with us, whereas on the Continent, but apparently not in America, such construction has made great strides for power line work; in addition to its general neatness, reinforced concrete, when well made, has the advantage of being permanent, whereas wood is subject to continual depreciation, and steel supports, whether sectional, tubular, or of lattice work, require periodical painting.

In this country timber of all kinds has been comparatively dear for years, hence it does not pay to import poor stuff for such purposes, but it pays to creosote it thoroughly in order to get as long a life as possible; and, further, shapely material is the rule.

On the Continent for railway and post office telegraph work, and to a lesser extent for electric power work in the past there has not been the same care used with regard to the selection of timber for appearance or durability and, as a rule, the preserving processes have not been carried out as thoroughly as at home. Difficulties due to the decay of woodwork have encouraged the development of armoured concrete abroad.

About the first to construct armoured concrete poles was M. Delamarche, of Grenoble, who in 1901 erected a line between two cement works in which he was interested, and from that time onwards the use of concrete poles has expanded in France, other countries following suit. The sections used are very varied: (*a*) Hexagon with a circular hollow, vertically; (*b*) oblong box shape; and (*c*) rectangular, with horizontal cylindrical openings. These three types were developed by M. Delamarche. Fig. 1 shows a pole of the type (*c*), with a transmission line on the right side and distribution wires on the left. The designs of this engineer are now used by the "Conduites et Potaux" Company, of Grenoble. The brackets are double in this case, being gripped with bolts on each side. Other types are of a plain H section, an H section lightened with windows, a bulb rail section with ribs forming honeycomb, a square section hollowed out with windows, and a section made with four rectangular corner posts braced with horizontals. In Italy, Sweden, and Germany centrifugal-cast poles have a considerable popularity. In France, before the war, armoured posts were usually made to the specification then customary for building work; they were, as a rule, heavy, and were used primarily for comparatively heavy trunk lines at 15,000 to 45,000 volts. Owing to their weight they were hardly suitable for rural h.p. distribution lines where first cost was an important consideration. Some of those who were in France between 1914 and 1919 may remember the heavy ferro-concrete poles stretching towards Doullens and Amiens from Arras, shattered in many cases by shell fire, and the commencement of a line from Abbeville towards Tréport. In the south and east of France considerable developments took place during the war in the use of concrete, especially for main transmission lines in the Grenoble area. The height varied up to about 48 feet.

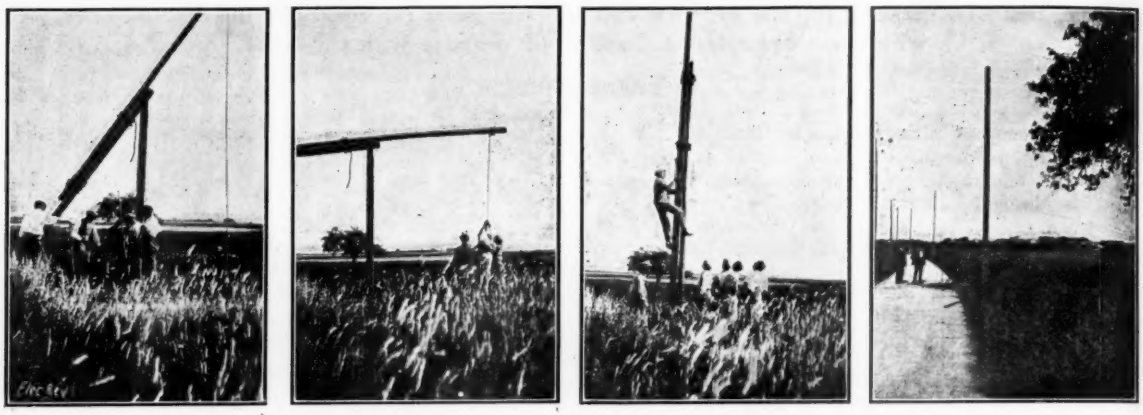
Since the war there has been continuous progress regarding the use of concrete for semi-distribution and distribution lines, and supports of various types can be seen in almost all parts of the country. As a rule, when there is a contract for so many miles of concrete poles, space is hired at some convenient point where



Figs. 3 and 4.—Erecting a Two-part Armoured Concrete Pole.

ballast is obtainable; the poles are made on the ground in the open air and carried to their destination by lorries and trailers. After the war a demand for power sprang up all over the country, and a number of rural

lines were rushed up with untreated forest poles, some of which have deteriorated with great rapidity. As a rule in France, h.p. distribution lines run alongside the roads, electric lighting authorities having the right to put up lines at a small fee per pole per annum.



Figs. 5, 6, 7 and 8.—Stages in the erection of a Two-part Armoured Concrete Pole near Dreux, France.

Where, however, the land is not too much cut up into small plots, there has been a material increase in cross-country lines.

A demand has sprung up for concrete poles which are lighter in weight and therefore more handy for

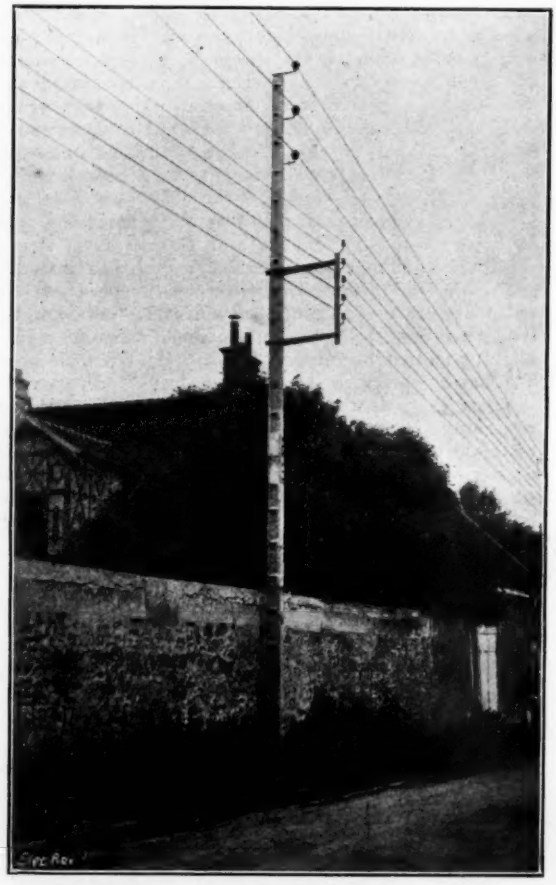


Fig. 9.—An Armoured Concrete Pole at Graetz.

erection than earlier types, which can compete in first cost with good-class wood poles; these have the added advantage of permanency, and therefore can be used for general rural h.p. distribution work.

To meet this demand a type of pole, known as the "Sanca," has been developed; it is made by the Société des Applications Nouvelles du Ciment Armé, of Paris. It is made of high-tensile cement, the armouring being of high-tensile steel, so that the weight is cut down, while to aid transport, a matter of special importance where poles have to be man-handled for cross-country lines, it is made in two parts.

Up to recently a number of attempts have been made to construct a satisfactory sectional armoured concrete pole, but without technical or commercial success. M. Allard, engineer of the above company, got over the difficulty in a simple manner: the pole is made in two parts, the section of it being that of an H. The two halves are joined by means of two heavy galvanised fishplates placed flat against the flanges. Bushes are let into the concrete and cast to gauge; with the aid of six fitting bolts passing through the fishplates, three above and three below, a joint is made between the two halves. The result is that we get a pole which in the ordinary way is cast indoors on factory lines by labour accustomed to the job. The two lengths can be shipped

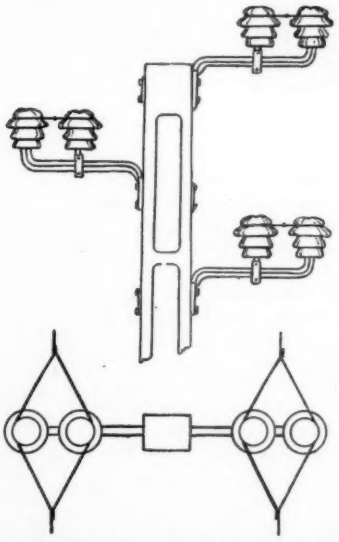


Fig. 10.—Arrangement for Road and Telegraph Line Crossing.

in ordinary Continental railway trucks, not troublesome timber trucks, and they can be unloaded into a lorry without a crane and man-handled across a field, if required, without difficulty. Taking, for example, a pole 10 metres (32 ft. 9 in.) long, for a normal cross loading of 400 lb., the upper part weighs about 4 cwt. and the lower about 5 cwt. In the case of an 11-metre pole, 36 ft. long, for the same loading, the upper part weighs about $4\frac{1}{2}$ cwt., the lower part being about $6\frac{3}{4}$ cwt.

A connection is made to the armouring below for an

earth plate, if desired, and the connection is continued by the steel fishplate. The bolt holes for the insulator brackets are bushed, and these are connected up in turn to the armouring. Two poles can be bolted together to form a stiff arrangement for angles, as can be seen in fig. 2; they are also used to form A poles. When the posts are not too heavy, an ingenious arrangement can be used for erection. The butt of the lower section, with the fishplates bolted on, is dropped into the hole, which is stepped, the top sloping sideways; the lower end is lifted up and the top bolt pushed through the fishplates and pole (see fig. 3). Using the top of the post as a prop, and pushing forward, the lower part is brought to a vertical position, fig. 4, and then rammed, fig. 5. In the ordinary way a special spar is provided, fixed by a sort of clip, but in the photograph, in the absence of the special appliance, a temporary spar was tied on to the base of the upper part, and by means of a rope the upper part is pulled round with the top bolt through the fishplates as a hinge, as can be seen in fig. 6. When it is vertical, a man shins up the pole and drives in the remaining two bolts and tightens up, fig. 7. A small gap remains between the upper and lower parts; to make the connection absolutely rigid, two short iron wedges are driven into the little gap, and a touch of cement finishes the job, fig. 8.

The photographs reproduced were taken outside a village near Dreux, about 50 miles west of Paris; the erecting gang, belonging to a private local distributing company, was putting up a new line with longer spans to replace a line on the other side of the road on wood poles. The gang that same morning had put up three poles with the aid of a gin; the polemaker's foreman-electrician showed them how to set about the job in the new way, and the photographs picture their first attempt. The following poles naturally went up much quicker, and the men were much pleased at the reduction in effort involved, as compared with erection by the usual means. As will be seen from the illustrations, there was standing corn right up to the roadway, and it was noticeable how much less corn was damaged by the new method, as compared with the old. Fig. 9 shows one of these poles in the country town of Graetz. The upper conductors are at high pressure, the lower five being low-pressure, 3-phase wires, a neutral and a switch wire for street lighting. Fig. 10 shows one arrangement used for road and telegraph crossings; the spans are reduced and the insulators doubled, that is all; no elaborate cradles or other money-wasting devices are used; if anything in the nature of a net is asked for it is of the simplest character. The writer questioned the foreman linesman of a rural power company, near Paris, who was responsible for many telephone crossings; he said the local postal authorities knew he took special care to see that the crossings were kept O.K., and therefore he had no bother with them at all. About 900 miles of line with this type of pole has been erected to date.

With 4-mm. diameter copper and spans up to about 95 yards, roadside lines are being put up in France with this type of concrete pole for 15,000 volts at about £100 to £130 a mile; outdoor labour, however, is materially cheaper than with us, although the price of materials does not differ so much. Needless to say, it does not require reams of correspondence or yards of red tape, with corresponding delay, worry, and expense, to get such a line under way; if it did, thousands of miles of line on the Continent would never have been built at all. Many matters are settled locally.

Concrete posts have been tried out abroad for a number of years; their use has grown so much that a standard specification has been drawn up by the French Union of Electrical Associations. Owing to our climatic conditions, there must be many openings for their use at home.

Credit and the Electrical Trader.

What he must Do to Obtain it, and the Care he should Exercise in Giving it.

By CHANDOS BIDWELL.

IN the conduct of any class of electrical business the "credit" factor takes an important position. It is even said by some that it may replace capital, and there is at least no doubt that without it modern trade would be but a ghost of its present robust self. Wherefore it becomes the commercial electrician to study at least the fundamentals of this aid to better business.

With two forms of credit every trader is concerned. There is the credit status which he needs to establish with his banker, and the credit which he will be asked to extend to a proportion of his customers. Each of these two widely different phases is governed by its own rules and customs.

Once a reputation has been established with the banker, credit is good throughout the trade. For the banker is the accepted referee of financial standing and respectability. Firms with whom it is desired to keep an account will apply to the banker who, though he will not damn any customer of whom he knows too little to give a considered judgment, has his own means of putting wholesalers and others on their guard against those who are so unbusinesslike as not to take advantage of the established credit system. A good name with the banker is at least 40 per cent. of good business.

The Value of the Banker's Aid.

Once the commercial electrician earns that good name he may obtain for himself the very considerable aids and facilities afforded by a good credit status. When an error of judgment results in the trader having too much stock in certain lines on his hands; when business is poor; when extensions and improvements are being made "out of income"; when the chance to make a big deal coincides with a low water mark in the bank balance—these are just a few random instances in which the electrician may need to call in the banker's assistance.

Yet the banker is no common money-lender. He requires more than "your note of hand alone" before he will make an advance. He wants to know, in short, the strength of the trader's position. He surveys the account kept with him, noting the average balance maintained. He observes the manner in which the account is conducted—whether cheques in excess of the then existing balance have been drawn at any time, the regularity or otherwise of payments in and withdrawals. He takes note of the firms with which the applicant deals, and satisfies himself that no transactions with money-lenders or bookmakers are made through the account. The steadiness of the business, the profit as compared to the turnover, and the strength of the latter are other points which are borne in mind.

The estimation of the public and of business men as to the electrical trader's position is a weighty factor. Even this it is the banker's business to know. A reputation for sound methods and acumen goes far in the

banker's summing up, for it is obvious that he cannot risk advancing to a customer liable to launch out into hare-brained schemes. Being the confidant of so many of his clients, the banker is often able to support his estimate by mental reference to family history and individual obligations—whether there are any dependents or other consistent drains on income.

Credit Ways and Means.

Having decided that the trader's position warrants his being allowed a certain amount of credit by those who inquire as to his financial reliability, or that it merits the advance of a certain amount of money, the banker proceeds to "rate" him at about two-thirds or one half of the public's and his own opinion of the value of his visible and invisible assets. This he is bound to do in order to cover the ever-present possibility of depreciation. So much for the establishment of that very necessary attribute—good credit with the bank.

Whether a business run partly on a credit and partly on a cash basis pays as well as one confined to cash trade is a moot point which can be decided only by the individual, according to the neighbourhood and to the class of customer with which he does the major part of his business. Here we are more concerned with ways and means.

Credit must be given by the trader only after due consideration for various cases, just as credit is only given by the banker with care and forethought. First, it is necessary to ascertain whether there is sufficient capital to permit of the trader's waiting for his money. Secondly, must be decided the point as to whether credit will benefit *his* business or whether it will merely involve a succession of bad debts.

Keep Accounts "Moving."

Every reasonable care must be exercised in the conduct of this branch of business, for it is indeed a delicate matter. Monthly bills should be rendered to all those privileged to make purchases "on account" and, when the business is young, it is well to insist on their being paid within a fortnight of the date they bear. Thus it is possible to keep in touch with moneys outstanding.

"I have a lot of money on my books but I cannot get it in," is a remark too frequently heard; many who utter it fancy it is a strength—yet it is actually a weakness. That money outstanding is dormant, earning no interest. The trader must keep on replenishing his stock while the money due to him is increasing. "Credit" to be successful as a business aid must be liquid, constantly moving.

Suppose, for example, that a customer buys goods to the value of £5, of which the trader takes 20s. as profit; if that bill is not paid up for six months, half the profit is lost because that £5 might have been "working" and turned over as new stock earning its own interest at a minimum rate of about 10 per cent. Here is a point which compels reflection. There is no reason why credit should not be allowed, but tact must be exercised in picking out those who will not abuse the favour.

Making such selection is not always simple. Outward show is a poor guide, but those at the commercial end of electricity will usually be able to judge much from their customer's profession or trade, and a shrewd man can often learn a great deal from a customer's manner. Reputations, too, can help him if he has lived some time in the district, for he will recognise the names of many who are desirous of putting themselves in the way to benefit by his service. Where a lot of money is involved, one can always fall back on obtaining a reference from the customer's bankers. No circumstances justify electrical traders allowing their businesses to be half-strangled for the convenience of others who use their capital. Unless credit transactions be kept well in hand, they had far better be cut out of the books altogether.

Sales-promotion and profit-boosting schemes were never more insistently prosecuted; it is therefore more essential than ever it was that the commercial electrician should develop his business sense and system in order that he may make the most of better business. Financial questions must be tackled seriously, and this matter of "credit" is one of the most important. Thought given to its two primary aspects, as briefly outlined above, will repay the electrical trader by enabling him to make the most of the outcome of better business—money.

The Problem of the Engineering Executive.

(COMMUNICATED.)

THE whole secret of the successful management of an engineering, or for that matter any other, works is bound up with the problem of obtaining for each job the man who is really fitted to fill it. That is a salient fact that has been demonstrated in these columns again and again. It is not enough to have skilled and efficient workmen, hygienic workshops, and the best machinery money can buy. Even with the highest grade of material, backed up by a world-wide reputation, satisfactory service does not necessarily follow. Success, which after all is only another way of saying satisfactory service, will only be achieved when all the factors are properly co-ordinated and made to function with the highest efficiency. It is on the engineering executive that this responsibility falls. Be he foreman, works manager, superintendent, or director, in some degree the problem of blending the various men and materials at his service must be faced and solved. He has it in his power to enhance or impair his firm's reputation for service. Hence, the superlative importance of finding the right men for these positions.

During the past few months the same problem has been broached on a much wider scale in the proposal of the Society of Technical Engineers to promote a Bill enforcing the registration of engineers. Considerable discussion has taken place anent this project, and it has been suggested that the influx of young engineers to the profession should be regulated somewhat in the way that immigration into the United States is regulated.

At first glance these two problems of engineering control appear to be rather widely separated, but they have one thing in common. Each is definitely concerned with the fitting of men to jobs.

There is no doubt that in the first case, which deals with a limited field, there is a difficult problem. How many industrial concerns in this country are daily hampered by bad and inefficient management it is difficult to say; certainly the number is considerable. The second instance cited, dealing as it does with the whole of the profession, covers a much wider field, but basically the problem is similar: to find the right man for the job.

What is the solution of the problem? Is there any way of ensuring a future supply of men, efficient technically and suitable psychologically, for the responsible posts in the profession, that will in due course become vacant? After a careful and intimate study of the management side, the technical side, and the educational side, there is only one key that holds any real promise at present of unlocking the door to the solution of this problem. And even this method has still far to go before it can really affect the trend of events in the profession. The method to which the writer refers is that of psychological grading and selection.

In England, in spite of the arduous pioneer work of a number of eminent scientists, we have made but little progress with the application of psychology to vocational selection, at any rate on an extensive scale. In both the United States and France, however, the method appears to have been practised on a somewhat wider scale. In both these countries in certain professions, applicants are submitted, amongst other things, to a variety of tests which have a psychological basis. For instance, in Paris applicants for posts as electric car drivers are tested in such a way as to demonstrate exactly how they respond to various combinations of circumstances representing the conditions which are to be expected on the road. Only those who show the necessary mental qualities are permitted to pass for training for what is undoubtedly an onerous duty.

Surely it is in this direction that we must look for some solution to our problem. Whilst it is not an easy matter, it is, the writer feels sure, well within the capabilities of our leading psychologists to devise tests that will yield the information that appears to be of such supreme value. Mistakes will doubtless be made, but mistakes may be learned from. It will then remain for the leaders of industry to pay serious heed to the pronouncements of the experts. This may easily prove a serious stumbling block, for it takes a very big man to listen to advice, even from an expert, on the selection of his staff. If, however, the practice could once be introduced of obtaining the considered opinion of a psychologist, there is every probability that the movement would develop. Perhaps we might even see that era introduced when a man seeking an appointment would carry with him not only certificates of technical status, but also authoritative documents giving a definite indication of his degree of mental fitness for any specific position.

That some such method of selective appointment is necessary is clearly apparent to anyone who has studied engineering management in England at first hand during the present decade.

Electric Crane Practice.

The maintenance of electric cranes in the steel mill, some of the causes of breakdown, and suggestions for their prevention.

By W. ERNEST RICHARDSON.

FOR a number of years the writer has been intimately associated with electric crane work in a steel mill, and during that time a great deal of practical information has been absorbed, some extracts from which, it is hoped, will prove interesting and instructive.

In a modern steel works the duties of an electric crane are extremely severe. From the time a charge is put into the furnace to that when the finished product is placed into the dispatch wagon, every effort is made to ensure the maximum output with a minimum of delay. On this account, anything in the nature of an interruption of the normal procedure is looked upon as a serious matter, so that the reliability of all the apparatus installed is a factor of considerable importance.

This applies particularly to the electric crane, through the agency of which the steel, during its various stages of manufacture, is transported from place to place. As an example, in a plate mill the slabs, heated ready for rolling into plates, are conveyed by an electric crane from the soaking pits or furnaces to the rolls. After passing through the rolls, the plate is picked up by another crane and taken to the shears, where it is cut to the required size. Then yet another crane loads the plate into a truck for dispatch. Now, it will be obvious from the above that in the event of any one of these cranes being laid idle through accident, the result would be felt throughout the whole system. Clearly then, with these conditions prevailing, one of the essentials of electric-crane work is that of utilising some medium whereby continuity of service may be secured. It is due solely to this fact that the need for the skilled maintenance electrician arises, on the one hand, and the need for a skilled crane fitter on the other.

In work of this description the usual practice is to employ an electrician and a fitter, and make them responsible for the running of a number of cranes. This responsibility, if the work is to be done properly, necessitates the daily inspection of each crane, a proceeding which calls for an ample allowance of time. In regard to the latter fact, experience has proved it to be false economy to give a man more work than he can manage in the stipulated time. In the writer's opinion eight or ten cranes will keep the electrician employed fully. Anything above that number means scamped work on running repairs and mere cursory examination of each crane.

Another thing often lost sight of is that, with the exception of breaks between shifts, and at meal times, when there is a temporary cessation of the activities of the mill staff, all the work has to be done on running gear, which calls for great care if personal accident is to be avoided. This means that more time is taken up than is the case with gear where a few minutes' stoppage is not of vital importance. These facts are worth the careful consideration of those directly concerned with the management of a works or factory.

So far we have seen what is required of an electric crane in a steel mill in the way of conditions of service. In order to carry out these needs, a crane must be suitably equipped. The equipment usually consists of a main travel motor, a traversing motor and a hoist motor, together with their controllers and resistances. In addition to these, the best modern practice demands an electric brake for each motor, and also some form of mechanical brake for the hoisting motion. The last is necessary for several reasons, principally the possibility of failure of the electric brake. These are the most important parts of the apparatus, and it is from one or other of them that trouble generally arises. At this stage it might be advisable to enumerate one or two of the possible causes of breakdowns in the electrical gear. It is a good plan to consider the mechanical and the electrical gear jointly. How often, when reading some text-book, does one come across an expression such as "fully 60 per cent. of electric motor troubles

are due to defects in the commutator"? Yet, how often are the causes of such defects explained in a practical manner? Quite recently the writer had to deal with the case of a travel motor which, previously irreproachable in its conduct, suddenly developed all the symptoms of excessive overload. To such an extent did its temperature rise that the solder melted at the commutator, thus causing an open circuit in the armature windings, and, incidentally, a 40-minutes' stoppage while the armature was changed. The trouble turned out to be the result of the main road wheels binding on the rails.

Pinions too deep in gear are another sure source of commutator trouble, if not promptly attended to. When trouble of this kind occurs between the first and the second motion pinions, a simple cure is to insert sheet-iron liners between the motor feet and the bedplate. A number of these liners should always be ready in case of emergency. The writer has proved it good practice to drill a hole in the centre of each liner and then to cut a slot from one edge to the hole. This method has the advantage that liners can be introduced under the motor without withdrawing the holding-down bolts. In fact, it is only necessary to slacken the nuts back two or three turns. This is a good time-saver and one well worth adopting.

Sometimes the cause of commutator defects can be traced to the mechanical brake. Here is an actual account of such an occurrence. About six months ago a 15-h.p. hoist motor began to fail with remarkable regularity. Careful inspection of all the apparatus attached to the drive failed to discover the source of the trouble. For about a month things went from bad to worse. Armatures were changed with monotonous frequency, until it was finally decided to dismantle the mechanical brake. This decision represented the last shot in the locker, and the operation was commenced in a mixed atmosphere of trepidation and hope.

After it was taken down the brake was subjected to careful scrutiny, and it was found that the friction surfaces were not being lubricated properly. Further, it was plainly to be seen that the existing system of lubrication was totally inadequate. In view of this, it was resolved to chip oil grooves in each friction surface, taking the grooves to the periphery of each disk, thus forming a kind of oil hole through which the oil was fed to the rubbing surfaces. The result was complete success, and the motor has given no trouble since then.

In the foregoing, instances of faults in motors, due to mechanical defects, have been dealt with only. It is felt that purely electrical faults, which arise from dirty brush gear and such like, are, or should be, well known to every electrician employed on this class of work, so that no time need be wasted in repeating them, as it is desired to record a few factors which tend to delay the speedy rectification of breakdowns.

Recently three bolts had to be changed in a motor coupling; in order to do this, the keep had to be taken off the back bearing of the motor before the old bolts could be extracted and the new ones put in. Before the keep could be removed a $\frac{5}{8}$-in. spanner had to be cut down to a length of about 2 in., so limited was the working space. On this particular crane that process has to be repeated every time the armature is changed in the hoist motor. On another type of crane, the centre section of the travel shaft, including the second motion wheel, has to be taken out before the travel motor can be changed. A further example is that of a crane whereon the cross traverse brake has to be dismantled, and the motor slackened back in order that the second motion shaft may be removed, all because the brake sheave, which also acts as the motor coupling, is spigoted.

In another type, the hoist motor armature shaft carries a brake sheave next to the back bearing, then a pinion which fits close to the sheave and flush with the end of the shaft. When changing the armature of this machine the pinion must be removed first. Unfortunately, the removal of this pinion always necessitated a pinion drawer, since the gib almost invariably broke off the key when wedges were used on it. Eventually, however, the difficulty was disposed of by substituting a double-gibbed key, thus enabling four wedges to be used simultaneously.

The above-mentioned misfits are only a few of the shortcomings which create delay at a time when speed is most required. Given a little more attention to detail, they could and should be eliminated in the interests of all concerned in the production of steel.

Electrical Progress in Mexico.

New Construction Works in the Federal District to cost £1,800,000.

(From our Special Correspondent.)

MEXICO, commercially considered, is, perhaps, endowed with the most elaborate and complete electrical installation for both power and lighting of any of the Latin American States. This fact is due almost entirely to the remarkable enterprise of a British concern, the Mexican Light and Power Co., Ltd., established twenty-five years ago as a Canadian corporation, with its head offices at Montreal. It would be no less true to mention that no foreign corporation with its habitat in Mexico has had to meet more troublous times, which have been bravely and patiently borne and surmounted through a display of admirable courage.

It was not to this company, however, that the original concession was granted. It was in fact, a Frenchman, Dr. A. Vacquié, who succeeded in obtaining from the late President Porfirio Diaz a contract, subsequently much enlarged, for the utilisation of the waterfall of Necaxa (situated in the State of Puébla) for the generation of electrical energy. From these original plans, which involved merely the installation of a single hydro-electric station in the city of Mexico, and the sale of energy at wholesale rates for power purposes in that city and its immediate vicinity, the enterprise grew —and has grown year by year, until to-day it serves not only Mexico City, the capital, the whole of the outlying Federal District together and the mining towns of El Oro, Pachuca and Angangueo, but a number of other towns in the contiguous States of Mexico, Hidalgo, and Puébla. The supply company has 109,000 consumers upon its books, and of these nearly 94,000 are lighting consumers, with a contracted load of 850,000 lamps, and 5,600 are power consumers, with a contracted load of 140,000 h.p. To them have to be added over 9,000 heating consumers. Already, at the end of 1925, the reservoirs belonging to the company had a storage capacity of 171,078,000 cu. m. of water, and hydro-electric and steam-generating plant with an installed capacity of 194,690 h.p., producing 560,688,215 kWh annually.

Notwithstanding the unfortunate political situation in Mexico to-day, engendering a commercial depression of long duration and increasing gravity, development work by the Mexican Light and Power Company has not ceased. At the present time there are under construction a number of additional works, and before the end of the

current year the reservoirs should possess a storage capacity of over 180,000,000 cubic metres of water, and the hydro-electric and steam-generating plant will have a capacity of more than 195,000 h.p., producing about 650,000,000 kWh annually. These figures, although only approximate, afford some idea of the magnitude of the undertaking conducted in a country much disturbed both by internal and external events.

The installations now being completed will call for the expenditure of at least 28,000,000 pesos (nominally £2,800,000), to be devoted mainly to the overhauling of existing plants and distribution systems and to the construction of a number of new sub-stations. The demand for electricity in Mexico City and the immediate district is ever-insistent and, large as is the capacity of the supply company, it is not, nor for some years to come is it likely to be, equal to the requirements of this great commercial centre of the Republic.

The growth of the demand for electrical power during the last few years may be gauged from the following figures. In 1921 the output was 369,300,000 kWh; in 1922 it increased to 442,000,000 kWh; in 1923, to 477,100,000 kWh; in 1924, to 523,600,000 kWh; and in 1925, to 560,665,000 kWh.

How to meet the demand of the present time has proved a sufficiently difficult problem to solve. The selection of a suitable power site, in itself, was far from simple; but it has been overcome by deciding to make use of an area near Tepuxtepec, in the State of Michoacán-de-Ocampo, not only because this will satisfy the power requirements, but because the dam to be built would be made to hold enough water to irrigate a wide and potentially productive agricultural district near Acambaro, and, at the same time, tend to prevent the floods which frequently devastate the fruitful valley of the Lower Lerma river. Here, then, at Tepuxtepec, will be erected a large dam and power plant—to be known as the Salto-del-Remolino enterprise—which, together, are expected to cost 18,000,000 pesos (£1,800,000).

Work of a preliminary nature was begun at the commencement of this year. The contractors are the Compañia Mexicana Constructora de Obras Hidro-eléctricas, S.A., a subsidiary of the Compañia de Fuerza de Sud-oeste de Mexico, S.A., which, in its turn, is a subsidiary of the Compañia Mexicano de Luz y Fuerza Motriz, S.A. (the Mexican Light and Power Company). Behind the colossal dam built across the Lerma River will be stored a total of 500,000,000 cu. metres of water. Below the dam will be constructed a power-house wherein turbines, with a capacity of 60,000 h.p., will be installed. From this water will be brought through a straight-line tunnel 3 km. in length. The water having passed through the turbines will be utilised in irrigating 50,000 hectares of land, which the Government hopes to see put under crop or cotton cultivation. The artificial lake will cover about 5,000 hectares of the Yeregé Valley, into which five other valleys merge, the northernmost extending into the neighbouring mining State of Guanajuato, located on the north-east of the State of Michoacán-de-Ocampo. The Lermo river irrigates the upper reaches of the State of Michoacán, running east and west, and receives the waters of several affluents; finally it enters Lake Chapala, a sheet of deep water some 1,580 sq. km. in extent. Only one-sixth of it, however, belongs to the State of Michoacán, the remainder being the property of the State of Jalisco.

The construction of the Salto-del-Remolino dam near Tepuxtepec is not the only enterprise which the current year is likely to see completed by the Compañia Mexicano de Luz y Fuerzo Motriz. Reference has been made to the fact that the adopted plans include material improvements and additions to the distribution systems. Comprised within this project will be a thorough revision of all existing overhead lines and underground cables. There will be laid 25 km. of 6,000-V cable, while the transformer capacity of the Nonoalca receiving station will be increased to 15,000 kVA, to deal with the new 6,000-V system. Later on, new 20,000-V cables will be laid between Nonoalco and Indianilla sub-stations, to relieve the existing overhead lines, to create new line capacity, and improve the existing service. In addition, two new tramway sub-stations, each of 1,000-kW capacity, will be constructed, so as to provide additional power for the system and improvement of voltage conditions.

The International Electrotechnical Commission.

The Plenary Meeting at Bellagio, Italy.

(*Continued from page* 459.)

THE official photograph of the delegates taking part in the International Electrotechnical Conference at Bellagio is reproduced on p. 500, with the names of the chief delegates, who are seated in the front row. Immediately behind Prof. Busila is to be seen Mr. Le Maistre, and Mr. Good will be identified in the back row (the stem of the "monkey tree" forming the background); on his right are Mr. Rhodes (U.S.A.), and Mr. Baker, and on his left Mr. G. Storey. Standing behind Mr. Semenza are Messrs. Melsom, Richardson, and Wharton, and in close proximity to Prof. Lombardi are Messrs. Edgcumbe, Paterson, and Purse. Dr. Rayner and Mr. Hobart will be recognised standing in the back row.

All the delegates attended the meeting at Como, on Sunday, September 11th, together with other delegations forming an International Congress of Physicists, also a Telegraphic and Telephonic Congress. Altogether about 800 people assembled in the theatre at Como, at 10.30 a.m., when speeches were delivered by the Podesta of Como, Prof. Q. Majorama (Pres., Italian Society of Physics), Prof. G. Vallauri (Pres., Italian Association of Electrical Engineers), Prof. A. Garbasso, Prof. A. E. Kennelly (Harvard University), Prof. Janet (France), Sir E. Rutherford (Pres. Royal Society), and Prof. M. von Laue (Germany).

Sir ERNEST RUTHERFORD expressed his pleasure at being present to honour the memory of one of the greatest experimental philosophers whose work brought him into close contact with the British Royal Society. Volta was not only a scientific philosopher, but emulating the international congresses now visiting Italy, he was a traveller in many lands. There was a record of his visit to England in 1782, partly to make the personal acquaintance of his scientific contemporaries, also to get into touch with the development in science that was going on there. He was everywhere received with distinction as one of the most notable men of the age. A paper which he communicated to the Royal Society was printed in the *Transactions* entitled "On the methods of rendering very sensible the weakest natural or artificial electricity." In this paper he gave an account of the electrophorus, and in 1791 he was elected a foreign member of the Society. Subsequently—in 1794—he was awarded the Copley Medal for another paper.

The important paper read in June, 1800, "On the electricity excited by the mere contact of conducting substances," was written in French and communicated through Sir Joseph Banks at a time when Italy was being attacked by the Austrians on one side and the French on the other side—conditions rendering experimental research exceedingly difficult, and Sir Ernest Rutherford expressed great pride that the Royal Society had had the honour of first publishing this great paper which was to have such an enormous influence on the development of electricity and its application to all branches of industry.

At the conclusion of the meeting of commemoration the delegates were entertained to lunch at the Hotel Plinius by the Council of the City of Como, and subsequently members of the International Electrotechnical Commission laid a large floral tribute on the tomb of Volta—some five miles outside of the town.

Amongst the technical matters that have been under consideration, the subject of electricity meters was given sufficient time to permit of the discussion of the questionnaire which had been prepared by Dr. Schmidt (Germany). Full load and overload currents, dials, direction of rotation of rotor, markings, insulation tests, connections, and accuracy, formed the main headings upon which it was hoped to arrive at bases generally acceptable to all the leading countries of the world.

Under the able presidency of Col. Edgcumbe, considerable progress was made, and the few outstanding points which some of the delegates desired to discuss further with their national committees before coming to any conclusion were only of minor importance, which it is hoped will all be settled by exchange of correspondence through the official secretaries.

It may be said with pride that the excellent figures for accuracy which had been adopted by the British Committee (see B.E.S.A. Specification No. 37), after careful consideration and discussion with the manufacturers, were not challenged by any of the committees of other countries, the general tendency being to allow for international standards a little greater latitude.

The rating of rivers formed one of the new items introduced at the meeting, and members were appointed by ten of the countries concerned to discuss an agenda concerning the units to be used to express water power resources. This was alternatively expressed in horse-power and kilowatts. The matter was soon disposed of by a touch of humour, one of the delegates suggesting that it was time to kill the old horse and stick to kilowatts.

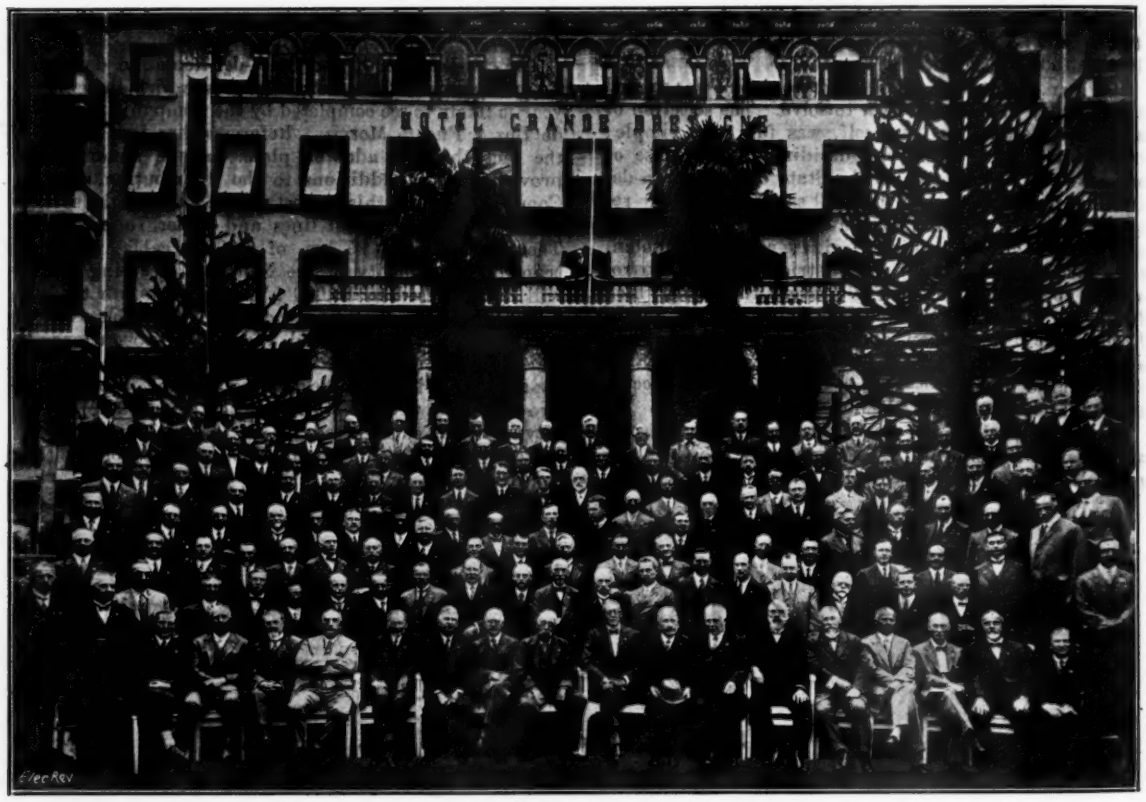
Next comes the question of the efficiency to be adopted; the normal flow can be readily ascertained, but the power available is a smaller figure, and as the nominated figure forms the basis in some countries of taxation, the cost of the concession, or the period during which the concession shall run, there was some lack of unanimity on this matter.

On the interpretation of "Head" there arose points for discussion as to gross or net figures; and with regard to "Flow" no less than one half the delegates desired to express this in two rates of normal and minimum, while others favoured an average flow.

No satisfactory comparison of the water power resources of different countries nor the amount already developed can be made until agreement is arrived at upon such points as these.

Consideration of "Nomenclature" occupied many meetings. Whilst every point agreed represents definite progress, the admirable example of the chemists must remain for some time to come the goal to be aimed at by the electrotechnologists.

At an earlier meeting two bases had been considered, known as the "alphabetical" and the "logical"; the latter had been adopted, and no fewer than five countries, working on this basis, had prepared extensive vocabularies. Something like 700 terms came immediately into the field for acceptance or modification. The British glossary was taken as a model, which provides



The members seated, from left to right, are as follows:—S. Norberg (Sweden); C. Bruun (Norway); P. Janet (France); Roger T. Smith (Great Britain); K. Strecker (Germany); C. H. Sharp (United States); C. Feldmann (Holland); Col. R. E. Crompton (Great Britain); G. Semenza (Italy); C. Mailloux (United States); L. Lombardi (Italy); P. Boucherot (France); E. Brylinski (France); C. Drewnoski (Poland); Lt. B. Atkinson (Great Britain); E. Huber-Stockar (Switzerland); C. Busila (Rumania).

The International Electrotechnical Commission at Bellagio.

for certain main groups to be known as Sections and appropriately numbered for reference; many of the suggestions would need to be considered also by the physical societies before any final conclusions could be reached, and the Sections must have provision for additional terms that in the future will have to fall into their logical order.

Prof. Clarence Feldman (Holland) has been selected as the president of the next congress, Signor Guido Semenza, honorary president, and Col. Edgcumbe, hon. secretary. The invitation of Norway, Sweden, and Denmark to hold the next plenary session in Scandinavia in 1930 was accepted.

In the meantime meetings of the Technical Committees will be held as and when they are desired, and the I.E.C. will act as the centre for co-ordinating the dates of any such meetings.

The Bellagio meeting terminated on Monday, September 12th, and following this the Podesta of Bellagio arranged a Venetian *soirée* on the lake, in connection with which he provided a special steamer, from which the delegates were able to enjoy the charming illuminations which had been prepared along the shore. Music and refreshments were provided on board, and the Podesta's hospitality and kind thought to entertain so large a party were much appreciated.

It was nearly midnight when the festival ended, and at 7.30 a.m. next morning the majority of the delegates left the landing stage and proceeded up the lake to Varenna, where a magnificent train of first-class coaches was placed at their disposal to convey them to Venice—*via* Milan, where some interesting visits were paid to important works to which reference will be made in a subsequent article.

Eventually the party met at the beautiful offices of the Stipel (which means the Society of Telephones Piedmont and Lombardy), where tea was partaken with all the additional delicacies that Italian hospitality can attach to such a pleasant function.

At 5.50 p.m., the special train proceeded from Milan to Venice, and when the terminus was reached two steam launches carried the passengers down the Grand Canal under ideal moonlight conditions, and thence to the Lido, where at about midnight rest was sought in the Excelsior Hotel.

The Venetian reception committee was presided over by Engineer Gaccia—the vice-president of the Adriatic Electrical Association, and under these happy auspices the delegates were to be entertained until September 16th.

(To be continued.)

Correspondence.

Correspondents should forward their communications as early as possible. ***No letter can be published unless we have the writer's name and address in our possession.***

House-wiring in Tropical Countries.

The recent correspondence in connection with improvements in wiring of buildings for electric light has interested me very much, but I have looked in vain for some comment on the quality of modern cables used for the purpose, now on the market.

For some years I have held the opinion that rubber as a dielectric for house-wiring cables in tropical countries is unsuitable. In India the life of rubber cables as used for house wiring is exceedingly short. Opinions may vary as to this life, but experience has convinced me that here, in Indore, its useful life does not exceed fifteen years, and Indore can be considered typical of Moffusil India, where, except for the rainy season, the difference between the wet and dry bulb averages 30 deg. Fahrenheit.

It appears to me that when wiring a building of "Pucka" construction likely to last indefinitely, something better than a fifteen years' life installation should be looked for. It is true that in a properly designed conduit system faulty wires can be replaced from time to time, but even this can result in serious consequences to decorations.

Is the quality of rubber now used for these cables equal to that used 25 or 30 years ago? To me it does not appear so, and if my impression is right why has it deteriorated? The reply I expect will be "Competition." Is this so? Have the public demanded cheaper cables at the expense of quality? I doubt it. I cannot understand why we are asked to accept cables of an inferior quality when, of all manufacturers, none has hedged itself inside more rigid rules for its own protection against competition than the British Cable Makers' Association, whose cable I refer to in this letter.

Many years ago I remember working on a contract where the cable used was Callender's solid bitumen, and where there were no extremes of temperature, and, provided the cable was carefully installed, it seemed to me that the dielectric was an excellent one. Bitumen, I believe, is practically everlasting, but perhaps its inflammability is against it. The tendency also for the core to become decentralised at comparatively low temperatures probably had much to do with its disappearance from the market. This, I think, might be overcome by making the cable to consist of alternate layers of bitumen and bitumenised tape, and if, as I understand it is so, a process for rendering bitumen non-inflammable is now known, I think that, from the point of view of life, bitumen cable should be excellent.

Possibly rubber-insulated cable has been proved to be satisfactory enough in Europe, because all chemical research in the manufacture of the compound has been done in Europe. Would it not be advisable for some research in the same direction to be done in the tropics, in order to find a process capable of producing a rubber compound better suited to the conditions obtaining there?

I have recently had to arrange for the rewiring of a palace here, because of the bad state of the wiring generally, frequent fires having occurred during the monsoon period; yet the life of the installation is only about 17 years. In my own bungalow, which was wired fifteen years ago, I recently had six fires, all, fortunately, discovered before any damage was done. Investigation showed that the condition of the wires was so bad that there was no alternative but to rewire the whole building.

The matter appears to me to be important enough to merit the attention of cable manufacturers, and it is with this idea that I write.

C. R. Palairet.

Indore, Central India, *September 1st*, 1927.

The Marking of Foreign Goods.

Our letter on this subject, dated September 5th (ELECTRICAL REVIEW, September 16th, p. 462) has resulted in a very interesting correspondence, both through the Press and post. There seems to be a general consensus of opinion that Section 1 of the Merchandise Marks Act, 1926, is really very narrow in its scope, and is only intended to prevent the affixing of British trade marks or trade names to foreign-made goods without the consent of the owner of the trade mark or name. It appears, therefore, still to be possible for a British trader to import his goods up to 100 per cent., and to affix his own British trade mark or trade name to such goods without any indication that the goods are of foreign origin.

If the correspondence has done nothing else, it has probably drawn the attention of the public to the desirability, if they want British-made goods, of being careful to inquire as to the origin of the goods at the time of purchase, even although from all appearances they might assume that the goods were of British manufacture.

For **Rudge-Whitworth, Ltd.**
(JOHN PUGH, *Managing Director.*)

Coventry, *September 15th*, 1927.

Mutual Assistance for P.O. Wires and for Power Lines.

One landowner has made his consent to a telegraph stay-pole in a field which he owns conditional upon the G.P.O. not objecting to overhead power lines in his district.

May I ask if that *conditional wayleave*, granted to the G.P.O., cannot with advantage become a standard; but may I also ask that the wording shall be much clearer and more accurate than "X Y Z" put in his letter in to-day's *Engineer*? I suggest the following:—If the G.P.O. imposes conditions which make overhead power lines in this district unnecessarily expensive, consent for this telegraph stay-pole shall be withdrawn.

Theodore Stevens.

London, *September 16th*, 1927.

Resistance Amplifiers.

I have read with interest in your issue of September 9th an article by Mr. Paul W. Tyers, entitled "Resistance Amplifiers," and while agreeing with some of the conclusions of the author, I find some definite statements regarding the proper value for coupling condensers which are sufficiently misleading to cause many users of resistance amplifiers to conclude that they are improperly designed.

In column 1 on page 417, the author states that "In the normal type of resistance amplifier, unless the coupling condenser is about 0.1 mfd, the lowest bass will be poor." Now the actual facts are that, neglecting for the moment the shunting effect of the grid leak on the anode resistance, the loss of amplification due to the reactance of the condenser is a function *not* of that condenser alone but of the *time-constant* of condenser and grid leak considered as a whole.

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The time-constant may be defined as the number of seconds taken by the condenser to discharge through the leak to about 36 per cent. of its original potential, and is found by multiplying the capacity (in microfarads) by the resistance of the leak (in megohms). For any given combination of condenser and leak the time-constant (T) of which is known, the proportion of the theoretical amplification transferred to the next valve is $2\pi F T/\sqrt{(2\pi F T)^2+1}$.

Experiment has shown that the proportion transferred has to fall to about 60 per cent. or 70 per cent. before the loss can be detected by a trained observer with appliances for making comparisons by rapid change-over.

Now, assuming for the moment the use of a coupling condenser so small as 0.005 mfd. (*i.e.*, a twentieth of the minimum capacity fixed by Mr. Tyers) and a grid leak of 1 megohm, the time-constant will be 0.005 second, and the proportion transferred at 50 cycles is still over 80 per cent., or at 32 cycles 68 per cent. Further, a low time-constant of 0.005 is greatly to be preferred to a figure of 0.025 (0.1 mfd. condenser and 0.25 megohm leak), as transient high voltages will not disturb the equilibrium of the amplifier long enough to cause noticeable distortion.

Mr. Tyers makes a second mistake in stating that coupling condensers need not have mica insulation and that paper is good enough. To put his remarks into other words, he states that the insulation resistance of the condenser need not be *really* high. Now, that statement will bear examination only if one assumes that the grid leak is of so low a value that leakage through the coupling condenser is discharged so rapidly that no disturbance of grid potential arises; so low a leak would, however, materially reduce amplification due to its shunting effect on the anode resistance. One must not overlook the fact that the condenser and leak act as a d.c. potentiometer (*i.e.*, insulation resistance of the condenser in series with the leak), the effect of which may be to swamp the grid bias potential by condenser leakage at high anode voltages. As I have shown that a condenser of 0.005 or 0.01 mfd. is sufficiently large to pass all the bass desired, we may as well use a mica condenser, the cost of which will be quite small, as then we have a high ratio of R over C, a comparatively high grid leak, and consequently very little shunting of the anode resistance.

In these days of battery eliminators it should be noted that a coupling with a low time-constant (not exceeding 0.005 second) is a great help in preventing the unstable condition of amplifiers known in Americanese as "motor-boating." The "why" will be obvious to any competent radio engineer, so I will not dwell on the point.

Frank Phillips, M.I.E.E., M.I.R.E.
Chief Engineer, Burndept Wireless, Limited.

London, *September 14th*, 1927.

A Two-rate Meter.

I have been interested in the communication of Mr. J. H. Parker, M.I.E.E., and the letter of Mr. R. J. Hebbert appearing in your journal dated September 2nd, as well as that over the name of "Simplicity" in the same issue, and the letters of Mr. E. E. Sharp and G. H. Bowden of the 9th inst. All are closely connected with the same subject, *viz.*, rates of supply.

In March, 1926, I had the pleasure of drawing your readers' attention to the question of tariffs, and pointed out the absurdity of supply authorities endeavouring to differentiate between units supplied for lighting, heating, power, cooking, &c.—a far better result and greater simplicity could be obtained both in the wiring of the house and in the rendering of accounts by the adoption of a two-part tariff. I demonstrated that even a prepayment meter could be made to collect the proper charges under a two-part tariff. Unfortunately there is no such prepayment meter on the English market to-day.

A two-part tariff solves the problem of night supply to hot-water storage tanks and to every other type of domestic supply; no two-rate meter or time switch is required, simply one ordinary meter without complicated mechanism.

I regret that I am unable to agree with Mr. Sharp that a two-rate meter is necessary; it is often inadequate in fulfilling the claim made for it, as in many cases the peak load takes place during the morning and afternoon and sometimes again in the evening, nor is it practicable to have a two-rate meter and time switch fitted in every small domestic house complicated still further by prepayment mechanism.

The suggestion of Mr. G. H. Bowden has been tried out by myself in practice; although it does the trick it has a serious handicap in that the reading on the dial does not represent true kW-hours.

I am convinced that consumers greatly appreciate a two-part tariff and will use two or three times the amount of energy they did formerly on an ordinary flat-rate supply. So long as the terms of the two-part tariff are suitably chosen, I do not think there is any need for special night rates, with the complicated metering arrangements.

I also heartily agree with the Editors' remarks, and hope that the Electricity Board will deal with the question of bulk supply to distributing authorities in such a way as will give them no handicap in dealing with the retail business on two-part tariff lines without complications, and will not hamper or restrict the use of electricity for every purpose where it can be usefully employed.

Eltham, *September 12th*, 1927. **S. H. Penning.**

The Overhead Lines Club.

My attention has been called to the proposal in your issues of August 19th and September 9th regarding the formation of a Club consisting of engineers interested in overhead distribution in rural areas, and I would suggest that no useful purpose could be served by such a Club, as the various interests concerned are co-operating to the fullest possible extent.

If there is one thing engineers are suffering from at the present time (and this is generally agreed), it is the surfeit of associations and organisations which, to a considerable extent, are overlapping and making it extremely difficult for us to get through our work.

A brief sketch of what has been, and is being, done in connection with overhead lines may be of interest:—

In February, 1925, the I.M.E.A. inaugurated a Joint Committee consisting of representatives of the I.M.E.A., the Incorporated Association of Electric Power Companies, the Provincial Electric Supply Committee of the United Kingdom, and representatives of firms carrying out overhead-line distribution schemes.

This Joint Committee in November, 1925, issued in the form of a report its recommendations as to how the existing regulations might be modified. This report, as approved by the I.M.E.A. Council, was then submitted to the Electricity Commissioners. The Commissioners, after considering the report, suggested that as a special Committee of the Institution of Electrical Engineers had previously considered the overhead lines regulations which were finally issued by the Commissioners as El.C.39, it would be as well if the I.M.E.A. report were submitted to that Committee.

Eventually a joint conference consisting of representatives of the following met to consider the report, and its findings were sent to the I.E.E. Council:—

I.E.E. Electricity Supply Regulations Committee.

I.E.E. Electricity in Agriculture Committee.

I.M.E.A. Low-Tension Overhead Lines Joint Committee.

The I.E.E. Council, after considering the findings of the Joint Conference, is now in touch with the Electricity Commissioners in regard to the matter.

Alex. C. Cramb,
Hon. Secretary, I.M.E.A.

Croydon, *September 19th*, 1927.

[Receiving this letter whilst going to press, we are at a disadvantage; but we may say that the proposed Club is not intended in any way to hamper the operations of the Committees above-mentioned—on the contrary, its purpose is to support them and to spur them on to increased activity.—Eds. Elec. Rev.]

Legal.

Société Française Radio Electrique v. West Central Wireless Supplies.

In the Vacation Court on September 14th, before Mr. Justice MacKinnon, Mr. Shelley moved, on behalf of the plaintiffs, for an injunction to restrain the defendants from infringing the trade marks "Sferavox" and passing off the plaintiffs' make of loud-speakers till the trial of the action. The numbers of the trade marks were 462,973 and 462,974.

Mr. Cohen, for the defendants, said this was an isolated instance of passing off which had been brought about by defendants receiving certain invoices which led them to inadvertently make a mistake. He submitted that to launch a motion for a perpetual injunction under the circumstances was not a proper course, and he would ask the Court not to grant even an interim injunction.

His Lordship: But if they have got a registered trade mark, should not the plaintiffs have the advantage of it?

Mr. Cohen: Yes, but it is clear here that it was merely an isolated instance of the use of the plaintiffs' mark.

His Lordship said his order would be that defendants should give an undertaking till the trial, costs to be costs in the action.

Compensation for Loss of Employment.

The September *Journal* of the Amalgamated Engineering Union reports that, consequent upon the taking of a bulk supply from the County of London Electric Supply Co., Ltd., the generating plant of the Leyton Council was closed down and 17 men were thrown out of employment, while seven others suffered an alteration in status with a loss of wages. The trade union side of the National Joint Industrial Council for the Electricity Supply Industry asked for the matter to be submitted to arbitration under the Electricity (Supply) Act, 1919, and as a result the arbitrator (Sir Harold Morris, K.C.) awarded the 17 disemployed men sums ranging from £214 to £55 as compensation, and to the other seven amounts varying from £53 to £11, in all £2,069.

The Effects of Combination in the Electrical Industry.

IN the recent B.E.A.M.A. memorandum upon combines and trusts in the electrical industry (ELECTRICAL REVIEW, August 26th, p. 359), reference was made to the stability which the combination of British electrical manufacturers had brought to their industry. It was pointed out that uneconomic prices, while apparently favouring the consumer, ultimately led to the failure of the industry and reacted in many directions to work harm to the consumer.

The British Electrical and Allied Manufacturers' Association has now produced carefully-tested statistics to illustrate the improvement which has been brought about in the electrical industry by the introduction of stable manufacturing and price conditions. These figures have been arranged in tabular form, and are reproduced herewith.

PRICES AND COSTS IN THE ELECTRICAL INDUSTRY.

(1920 = 100).

Subject.	Factor.	Index. 1920	1921	1922	1923	1924	1925	1926	1927*
Prices.	Wholesale prices	100	64	52	52	54	54	50	46
	Average selling price of electrical goods	100	70·9	54·3	51·9	52·0	52·0	52·0	51·0
Wages.	Cost of living	100	88	72	69	70	69	66	67
	Average wage per hour in electrical industry	100	97	79	77	80	86	87	87
Electricity Prices and Plant Efficiency.	Power station efficiency	100	100	106	111	116	130	—	—
	Average selling price of generating plant	100	71·4	50·7	47·8	48·0	48·0	48·0	45·8
	Average selling price per unit of electricity	100	100	83·5	75·0	70·5	65·5	70·0	—
Foreign Trade.	Value of exports :—								
	(*a*) Actual	100	125	80	99	108	123	127	132
	(*b*) Adjusted to price changes	100	177	148	190	208	237	250	260
All Trade.	Index of orders received for electrical machinery	100	—	—	—	80	86	106	126
Prices of Electrical Machinery.	Turbines	100	66·0	49·9	43·0	43·0	43·0	43·0	40·0
	Turbo Alternators	100	66·7	56·2	54·7	54·7	54·7	54·7	50·0
	Condensing Plant	100	66·7	40·0	30·0	30·0	30·0	30·0	30·0
	Rotary Converters	100	74·1	52·9	52·9	52·9	52·9	52·9	52·9
	A.C. and D.C. Generators	100	71·9	50·0	41·8	39·9	39·9	39·9	37·0
	Dynamos and Motors	100	64·5	44·9	40·4	40·4	40·4	40·4	40·0
	Switchgear	100	74·0	64·8	64·8	64·8	64·8	64·8	64·8
	Transformers	100	77·5	54·0	58·0	60·2	60·2	60·2	58·0
	Accessories	100	80·0	68·0	68·0	68·0	68·0	68·0	65·0
	Meters and Instruments	100	70·2	56·5	50·5	50·5	45·0	45·0	34·6

* Based on first eight months.

The year 1920 has been taken as a basis throughout. The average selling price of electrical products has been based on energy output or on horse-power (which is the usual method of assessing prices in the industry) rather than on weight. Owing to the diversity of the products and the rapid changes that have taken place in design, weight has ceased to have any value as an indication of price. The average wage paid per hour in the electrical industry is based on all employés, exclusive of staff; improvement of power-station efficiency has been calculated according to the consumption of coal per unit generated; the index of orders received for electrical machinery does not include lamps, cables or transformers, and refers to the plant side of the industry. With this explanation, the full force of the statistics given may be appreciated.

It may briefly be said that the statistics indicate that careful costing and economic production has improved the competitive position of the industry; that labour is obtaining a greater proportion of the proceeds than in 1920; that the price of electricity has not been reduced in the same proportion as that of plant; and that plant efficiency has been improved. The reduction in cost, combined with the lowering of the coal consumption per unit generated, has reduced the real cost of generating plant to not more than 30 per cent. of that ruling in 1920. It is stated that electrical manufacturers have more than made good the depression in the home market through an active sales policy in overseas markets; they have met competition of the severest type and overcome it by sheer efficiency and the high reputation which they have established for their products. We recommend our readers who wish to study the above statement in fuller form to procure from the Economic and Statistical Department of the B.E.A.M.A., a pamphlet entitled "The Electrical Industry and The Consumer: Basic Factors Governing Price Tendencies," which is issued to-day (1s. net).

Greek Import Duty.

By a recent addition to the Greek Customs tariff, X-ray apparatus and apparatus for radio treatment and parts are to be subject to a duty of 5 per cent., *ad valorem*, upon importation into Greece.

Building Trades Exhibition.

AT the Building and Allied Trades Exhibition at Bingley Hall, Birmingham, which came to an end on Saturday last, full opportunity was taken to emphasise the claim of electricity for use in the home, the office, and the factory. An excellent series of conferences and lectures was arranged, and some of these were well attended by the public. Lady Brooks (president of the Birmingham Section of the Women's Electrical Association) presided at the first lecture, on "Domestic Electrification." She said that the Association existed solely for the purpose of educating women to the benefits of electricity, which was going to help women enormously in the future. Mr. V. W. Dale (British Electrical Development Association) observed that the use of electric power resulted in a remarkable saving of labour. With one unit, which usually cost about a penny, a floor polisher would work for ten hours, a vacuum cleaner for seven hours, a sewing machine for twenty-five hours, a washing machine for four hours, or an iron for two or three hours. Enough water could be heated for all domestic purposes, including baths for a family, at an average cost of about 2s. per week. The subject of lighting in works and factories was dealt with at one conference by Mr. J. L. H. Cooper. Good lighting, he maintained, would increase output, improve the quality of the work, reduce accidents, save time, and create a proper working atmosphere. The requirements of good lighting in the workshops were adequate and uniform illumination, freedom from glare, freedom from heavy shadows, light in the proper direction, and, in some cases, light of a proper colour. Alderman A. R. Jephcott, M.P. for Yardley, who presided, said there was a vast improvement in the conditions of factories since he worked in them 50 years ago, and in no respect was that improvement greater than in lighting. Good lighting was not only an advantage to the workpeople, but also to the manufacturers. In the afternoon of September 15th, a lecture on "Electricity for the Architect and the Builder" was given by Mr. J. W. Beauchamp (British Electrical Development Association). Alderman J. B. Burman, M.P. for Duddeston, who presided, said that so far as Birmingham was concerned, the Electricity Committee was progressing as fast as was humanly possible in the development of electricity. Mr. Beauchamp pointed ou that the great feature of the last five years in public utility had been the growth of the "service" idea of modern commercialism, in the business of supplying electricity. There had been a realisation that the business, whether run by a municipality or a dividend-earning company, did not stop at the consumer's meter, but continued until every consumer was satisfied with the service which he obtained—with the light, heat, or power, which was really what he bought. In the evening Mr. Beauchamp lectured on "Electricity as an Advertising Medium."

American Activities in Brazil.

The General Electric Co. (U.S.A.) has purchased the whole of the utility services of the town of Victoria (population about 10,000), capital and chief port of the State of Espirito Santo. The public services include electricity for domestic and industrial purposes and the running of electric tramways, which are to be extended and improved.—*Reuter's Trade Service* (Victoria).

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The E.D.A. Circle Campaign.

The Electrical Development Association informs us that campaign luncheons have been arranged in the following places: London, Liverpool, Glasgow, Manchester, Birmingham, Cardiff, Belfast, Edinburgh, Newcastle, Bath, Hull, Grimsby, South Shields, and Whitley Bay. Other Press functions are being organised at Hampstead, Ashford, and Greenock. All of these are being held on October 3rd, with the exception of the Edinburgh luncheon, which will take place on October 10th. Although the names of certain towns are given above, several of the functions represent the combined activity of a number of circles. The Manchester luncheon is to be held at the Midland Hotel. Tickets (5s. 6d. each) can be obtained from the secretary, Mr. R. Moore, 35, Berisford Road, Longsight, Manchester. Further arrangements for the luncheon, together with names of speakers, &c., will be announced later. The Liverpool luncheon will be held at a leading hotel. Tickets will be 5s. each, and are obtainable from the secretary, Mr. Hazell, of Lindsay & Co., 9, Cheapside, Liverpool. In connection with the Manchester luncheon it is interesting to note that during the afternoon of the same day a demonstration house is to be opened at Pendleton, and it is hoped that the combination of these two events will give a very good start to the campaign.

The Central Board's Scottish Scheme.

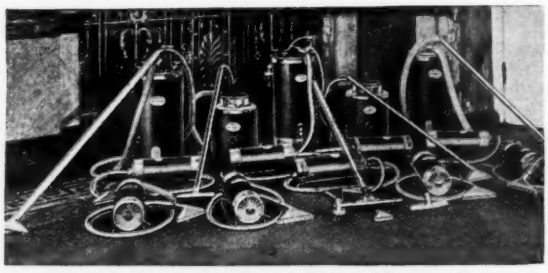
In the "Official Notices" section of our advertisement pages to-day there appears an invitation of tenders by the Central Electricity Board for the supply and erection of 132,000-V overhead transmission lines for its Central Scotland Electricity Scheme. This is remarkable in two respects: it marks the actual commencement of work in the reorganisation of Great Britain's electricity supply under the 1926 Act; and the voltage mentioned is the highest for which tenders have been invited in connection with transmission in this country.

"The World's Largest Battleship."

In an advertisement in our last issue, H.M.S. *Rodney* was stated to be the world's largest battleship. We are informed, however, that the *Rodney* shares this distinction with H.M.S. *Nelson*, which was built by Sir W. G. Armstrong, Whitworth & Co., Ltd.

Cleaning the "Coliseum."

A large order for vacuum cleaners has recently been fulfilled by VOLTA, LTD., for the management of the London "Coliseum." As will be seen from the accompanying illustration, the order comprised nine "Volta" machines of the



"Volta" Cleaners at the "Coliseum."

domestic pattern, fitted with an internal dust-bag, and five larger models of similar general construction. The machines are mounted on large easily-running wheels and are provided with an ample flexible hose and nozzles of various patterns for different applications.

Costa Rica Electrical Scheme.

A correspondent of the *Financial Times* refers to the possibility of developments in San Jose, the capital of Costa Rica, which may lead to a New York financial corporation—which has lately purchased considerable blocks of the stocks of the English company (the Costa Rica Electric Light & Traction Co.), and the whole of the American company's enterprise and is now negotiating for the absorption of a German concern entitled Electriona—forming a big comprehensive scheme, under American auspices, for the control of the electrical services of the chief Costa Rica centres.

Lamp Prices.

We are asked by the Metro-Vick Supplies, Ltd., to correct an error that occurred in their recent lamp advertisement where the price of the 100/130-volt, 60-watt gasfilled clear and pearl lamp is given as 2s. 3d., whereas it should be 2s. 8d.

The Timber Trade.

Our timber trade correspondent reports that the building woods market within the past month has been over-supplied, temporarily, with shipments from the North of Europe, a sequel to the heavy forward buying during the spring. Consumption, however, is well maintained, the building trade being very active, although the basic industries of the country are not yet sufficiently busy to cause any great timber consumption. The packing case trade demand also continues weak. In the hardwood market mahogany logs of prime grades have shown advances in prices at the auction sales in London, which in course of time is likely to be reflected on the retail market. Stocks in first hands continue short; lower grades are unsteady. Teak is very firm in price, and therefore slow of sale. The sawn hardwood section of the trade has again been over-burdened by further heavy supplies from the U.S.A. Those in search of something really nice in box-woods could turn to some of our Empire woods, for example, Indian laurel and padauk, Australian black bean, silky oak, and maple, West African walnut, as well as native woods obtainable from high-class timber merchants.

Unemployment.

The total number of registered unemployed on September 5th was 1,074,600. This represented an increase of 25,340 on the week, but was 484,940 lower than on September 6th, 1926, when the coal dispute was still in progress.

Electrical Exhibitions.

GRAVESEND.—Gravesend electrical contractors have taken premises at 146, Milton Road, Gravesend, for the purpose of holding a display of "G.E.C." household wireless, and lighting products from September 23rd-October 8th, inclusive.

Messrs. THORN & HODDLE, LTD., of 151, Victoria Street, S.W.1, suppliers of acetylene plants, petrol engines, &c., are giving a display of "Magnet" household electrical appliances in their showrooms until October 8th. The County of London Electric Supply Co. recently held a display of "Magnet" appliances in its Brixton showrooms. Further displays are being held in the company's Balham and Streatham showrooms until the end of September.

Registered Electrical Contractors.

At the last meeting of the Executive Committee of the National Register of Installation Contractors applications from the following for registration were approved:—

Buglass & Jamieson, Ltd., Dundee.
McKone & Haynes, Thornton Heath, S.E.
Ludlow, F., Rochdale.
Blyth Plumbing & Electric Co., Blyth, Northumberland.
Marsh, A. H., Ossett, Yorks.
Swift, F., Bradford.
Armitage & Longbottom, Bradford.
Nelson Bros., Blackpool.
Baker & Hyman, Leeds.
Wilson, H. (Birmingham & Bradford), Ltd., Bradford.
Hudson, R., Roath, Cardiff.
Edmunds & Niblett, Cardiff.
Austin Bros. Electrical Co., Ltd., Stratford, E.15.
Boddy, J. J., Bradford.
Elliott, A. D., Saltley, Birmingham.
Collier, J., & Co. (Electrical Engineers), Ltd., Manchester.
Harding & Johnson, Birmingham.
Bishop, W. J., & Co., Croydon.
Jones, F. J., & Co., Ltd., Chester.
Richardson, A., & Co., Sunderland.
Waring & Gillow, Ltd., Manchester.
Price, F., Tarver & Co., Cardiff.
Victoria Radio, Rusholme, Manchester.
Electric Super Service Co., Ltd., Dowgate Hill, E.C.4.
Joslins, Ltd., Colchester.
Malcolm & Allan (London), Ltd., W.C.2.

At the same meeting three applications were withdrawn and five declined. Also, twelve names were struck off the Register on account of non-renewal of certificates.

The E.D.A. Conferences.

As we reported in our last issue, the coming season's conferences arranged by the British Electrical Development Association commence on September 30th with an address by Mr. V. W. Dale, on the E.D.A. Circle Campaign; Mr. J. W. Beauchamp will take the chair. Subsequent meetings are as follows:—October 21st—"American Lighting Service Methods," by Mr. W. E. Jones, B.Sc. (chairman, Mr. H. W. Sprunt). November 18th—"Assisted Wiring, Hire and Hire-Purchase Schemes: Recent Progress," by Mr. S. E. Fedden (chairman, Mr. R. P. Sloan, C.B.E.). December 16th—"Electrical Progress in Cinematograph Pictures." January 20th, 1928—"Industrial Electric Heating Sales Possibilities," by Mr. E. P. Barfield (chairman, Mr. W. H. Cooke). February 17th—"Selling Refrigeration for Domestic and Small Business Methods," by Mr. J. T. K. Crossfield (chairman, Mr. A. J. Fuller). March 16th—"Personal Salesmanship," by Mr. R. W. Brymer (chairman, Brig.-Gen. R. F. Legge, C.B.E., D.S.O.).

The conferences will be held at the Royal Society of Arts building, Joan Street, Adelphi, W.C. There are no fees, and everyone electrical is cordially invited to be present. Light refreshments will be served at the close of the proceedings.

Trade Announcements.

The WELSBACH LIGHT CO., LTD., opened a new Scottish depôt on September 20th. The address is: 123, Fountainbridge, Edinburgh. Telephone: Edinburgh 22910; telegrams: "Welsbach, Edinburgh."

Messrs. FERRANTI, LTD., state that they have had a number of inquiries regarding the prices of their radio components, and inform us that they have no intention of reducing these prices or modifying the discounts during the coming season.

Messrs. HARWELL, LTD., of 28, John Street, London, W.C.1, have been appointed sole sales agents for Kugella vorm. Max Roth G.m.b.H., makers of switches and lampholders.

Messrs. E. K. COLE, LTD., of Leigh-on-Sea, are opening a depôt at Orme Buildings, Parsonage, Manchester, on October 17th, in charge of Mr. G. Ashton, their northern representative. Stocks will be carried and the firm will have a stand at the Manchester Exhibition.

Mr. H. N. SHORROCK, who has recommenced business as an electrical engineer at 79, Granville Road, Morecambe, asks for copies of the latest catalogues.

Owing to the continued expansion of its business, AUTOMATIC AND ELECTRIC FURNACES, LTD., is removing its offices and works to larger premises; on and after September 29th the address will be Elecfurn Works, North Road, Holloway, N.7. Telegrams: "Elecfurn, Holway, London"; telephone: North 5221; cables: "Elecfurn, London." The new works has been fitted with lifting equipment to deal with electric furnaces up to 6 tons in weight, and the most modern methods have been installed to deal with casemaking, &c. A large demonstration room has also been arranged.

Messrs. HENRY BACCHUS, LTD., electrical engineers, are about to have alterations and additions made to their premises at 35 and 37, High Street, Bedford.

The STELLA LAMP CO., LTD., has opened a new branch at 18, Victoria Buildings, Deansgate, Manchester (telephone: City 2331).

Messrs. PRINCE'S ELECTRICAL CLOCKS, LTD., state that their address is now: "Princeps Wireless," Columbia Avenue, Edgware, Middlesex. Telephone: Edgware 0380; telegrams: "Princlox, Edgware."

Messrs. WARING, WITHERS & CHADWICK recently removed to 11a, Torrington Place, Gordon Square, W.C.1. Telephone: Museum 9838-9; telegrams: "Waringites, Westcent, London."

New Catalogues and Lists.

MESSRS. ELLIOTT BROTHERS (LONDON), LTD., Century Works, Lewisham, London, S.E.13.—Catalogue (Section "C"), of 68 pages, giving illustrated descriptive matter and price information regarding the company's polyphase a.c. instruments.

THE ROTARY AIR COMPRESSOR CO., LTD., 12, Victoria Street, London, S.W.1.—16-page pamphlet describing rotary air compressors for all purposes and for pressures up to 150 lb. per sq. inch.

MESSRS. PETTERS, LTD., Westland Works, Yeovil.—Attractively produced 16-page pamphlet, giving full particulars of Petter electric lighting plants with pleasing illustrations of the sets and of typical country houses where they are in service. Priced.

MESSRS. JOHN SHAW & SONS, WOLVERHAMPTON, LTD., Wolverhampton.—An illustrated leaflet advertising "Electra" hair-waving irons. Priced.

TUNGSRAM ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., 72, Oxford Street, W.1.—A folder, illustrated in colour, giving details and prices of various types of "Tungsram" lamps.

THE WESTINGHOUSE MORSE CHAIN CO., LTD., Letchworth, Herts.—A well-illustrated catalogue of the company's chain drives.

THE STURTEVANT ENGINEERING CO., LTD., 147, Queen Victoria Street, E.C.4.—Publication No. 1074, containing illustrated notes upon the company's mechanical draught and cinder elimination plant. The uses of natural and mechanical draught are fully compared.

SIEMENS-SCHUCKERT (GREAT BRITAIN), LTD., 109, Kingsway, W.C.2.—An illustrated pamphlet dealing with the company's automatic telephone system.

THE METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—A set of new and revised leaflets for the company's sectionalised catalogue. These are all fully illustrated, they include price lists, and cover a wide variety of apparatus from motors to instruments.

THE HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, E.15.—A photographic cardboard cut-out depicting Dame Clara Butt, the celebrated contralto, and advertising the company's radio batteries with her recommendation. Also a mailing card advertising "Hart" automobile batteries.

THE NEW PROCESS CO., LTD., Grosvenor Mansions, 82, Victoria Street, S.W.1.—A bound series of leaflets depicting and describing "N.P.C." electric welding plant and accessories.

THE STELLA LAMP CO., LTD., Harlesden, N.W.10.—A series of illustrated leaflets giving details and prices of the company's lamps of all patterns, bound in a supple leather case. Amusing sketches by Alfred Leete are included.

COVENTRY ELECTRICAL APPLIANCES, LTD., Conduit Yard, Fleet Street, Coventry.—A priced and illustrated list of bowl fires, irons, kettles, toasters, and other domestic appliances.

THE LONDON ELECTRIC WIRE CO. & SMITHS, LTD., Playhouse Yard, Golden Lane, E.C.1.—A booklet containing illustrated descriptions and prices of "Lewcos" radio products, including inductance coils, transformers, &c.

THE TRELLEBORG EBONITE WORKS, LTD., Union Place, Wells Street, W.1.—A list of reduced prices of the company's ebonite panels.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Leaflets Wa 406/2, dealing with radio meters for panel mounting; Wa 408, describing the company's loud speaker; Wa 409, a permanent trickle charger for a.c. mains; and Wa 410, demonstrating the performance of the "Ferranti" A.F.5 audio-frequency transformer. All are illustrated, and the first three are priced.

THE WELLINGTON TUBE WORKS, LTD., Great Bridge, Tipton, Staffs.—A comprehensive catalogue of the company's tubes. In addition to illustrations of the tubes there are views of the works, reproductions of photographs of tested samples, &c.

BRITISH CENTRAL ELECTRICAL CO., LTD., 6 and 8, Rosebery Avenue, E.C.1.—A net trade price list of cables and flexibles.

"PARMOTOR" RELAY CO., 124, Chancery Lane, W.C.2.—An illustrated pamphlet containing a description of the "Parmotor" electromagnetic relay.

MESSRS. REAVELL & CO., LTD., Ranelagh Works, Ipswich.—Leaflet No. 153, illustrating and describing air compressors for charging the starting air bottles of i.c. engines.

Bankruptcy Proceedings.

WILFRED PERCY HODGE, wireless salesman, late of 92, Cannon Street, E.C., and residing at 46, St. Leonards Road, Exeter.—This debtor combined the business of a wireless salesman with the profession of minister at South Street Baptist Chapel, Exeter, but resigned the latter office last month. The first meeting of his creditors was held on September 14th, before Mr. E. Parke, Official Receiver, at London Bankruptcy Buildings, when it transpired that the liabilities amounted to about £1,500, against assets of the face value of £3,525, but only expected to realise £1,150. The debtor, who has been in the hands of moneylenders since 1921, attributes his failure to the loss of £2,775 invested in a company which came to grief in August, 1925, and the loss of £530 through the default of a broker. A resolution was passed for Mr. A. H. Hadden, accountant, to act as trustee and administer the estate in bankruptcy.

W. HANNA, 13, Carey Street, Burnley, Lancs., wireless dealer.—The public examination of this debtor was held recently at the County Court House, Burnley. The statement of affairs showed gross liabilities of £191, of which £182 was expected to rank, and there was a deficiency of £110. Debtor attributed his failure to bad health, keen competition, and reduced turnover through bad trade. He commenced business as a wireless dealer in June, 1925, but made no profit. He became aware of his position about six months ago, but continued trading in the hope of an improvement. The examination was adjourned to be closed.

G. S. DOUTHWAITE, trading as G. S. Douthwaite & Co., 25, Dean Street, Newcastle-on-Tyne, electrical engineer.—The receiving order in this matter was made recently on debtor's own petition. According to the statement of affairs, there were liabilities of £1,762, and assets of £478. The first meeting of creditors was held recently at the Official Receiver's Office, Newcastle-on-Tyne. The following are creditors:—

	£		£
Boulter (Mrs.)	200	Gledson, J., & Co., Ltd.	150
Electric & General Stores, Ltd.	222	Miller, J. & D., & Co. ...	82
		North British Engineering Equipment Co. ...	321
Foster Engineering Co., Ltd.	193	Watson, C. E.	391
		Watson, E.	100
Falk, Stadelmann & Co., Ltd.	38	Stemson, F.	307
General Electric Co., Ltd.	25		

STEPHENS & WEILL (Henry Sidney Stephens and Simon Weill, trading as), wholesale accessories merchants and importers of wireless accessories, Great Eastern Street, E.—At the adjourned first meeting of creditors under this failure, held on September 14th, at London Bankruptcy Buildings, a resolution was passed for Mr. Wyndham Aubrey, C.A. (Wood,

Aubrey & Co.), 64, Coleman Street, E.C., to act as trustee and wind up the estate in bankruptcy with the assistance of the following committee of inspection: Messrs. Frank Watterman and Richard Solomon.

G. R. HINDLE, 8, Hillside Avenue, Darwen, Lancs., electrician.—The public examination of this debtor was held on September 14th, at the County Court House, Blackburn. According to the statement of affairs, there was a deficiency of £136. Debtor attributed his failure to large household expenses and heavy interest paid to moneylenders. The examination was closed.

D. ROSCOE, 4, North Albion Street, Fleetwood, Lancs., late electrical and mechanical engineer.—The public examination of this debtor was held on September 16th, at the Court House, Blackpool. The statement of affairs showed liabilities of £198, and practically no assets. Debtor stated that he was formerly in business in partnership at Burnley, but in February, 1921, he left, taking over certain liabilities. Later he went to Fleetwood and started business in North Albion Street, as an electrical engineer. He was ordered to deliver to the Official Receiver an account showing the various contracts which he had undertaken during the last 12 months, and the moneys he had used in respect of those contracts. The examination was adjourned.

H. A. MILLS, electrical engineer, &c., 1, Lorne Villas, Old Windsor.—First and final dividend of 1s. 6½d. in the £, payable at the Official Receiver's office, 29, Russell Square, W.C.

R. G. ROBERTS, electrical engineer, Magnet House, College Road, Upper Bangor.—First meeting September 21st, at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester; public examination, October 28th, at the Court House, Bangor.

J. S. RHODES, electrical engineer, 102, Morley Street, and 74, Horton Lane, Bradford.—First meeting held September 21st, at the Official Receiver's office, 12, Duke Street, Bradford; public examination, October 4th, at the County Court, Bradford.

J. GLICKMAN (Manchester Radio Service Co.), wireless factor, 10, 12, and 14, Ducie Street, Strangeways, Manchester.—First meeting held September 22nd, at the Official Receiver's offices, Byrom Street, Manchester; public examination, October 14th, at the Court House, Manchester.

W. H. WILSON, electrician, 1, Bryn Terrace, Ruabon.—First meeting held September 20th, at the Official Receiver's offices, St. Peter's Churchyard, The Cross, Chester; public examination, October 13th, at the County Hall, Wrexham.

O. WALKER (Albion Electric Co.), electrical contractor, 112, Albion Street, Wallasey.—Last day for proofs for dividend, September 28th. Trustee, Mr. E. D. Symond, 11, Dale Street, Liverpool.

J. ATKINS (trading as Atkins & Co.), 59, Church Street, Tewkesbury, and at Northleach and Winchcombe, electrical engineer.—Last day for receipt of proofs for dividend, September 30th. Trustee: Mr. R. A. Rodgers, Coventry House, South Place, E.C.2.

H. NUTTER, 246, Yorkshire Street, Rochdale, electrical engineer.—Last day for receipt of proofs for dividend, October 1st. Trustee: Mr. F. Murgatroyd, Official Receiver, Byrom Street, Manchester.

J. H. PAINTER (trading as Venables & Co.), 99, The Broadway, Cricklewood, N.W., electrician.—Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2, released August 3rd.

T. N. SHEPHERD, Bridge Road, Stockton-on-Tees, and Queen Street, Redcar, plumber and electrical engineer.—Trustee, Mr. C. Turner, 155, Norfolk Street, Sheffield, released July 4th.

C. L. BURRILL, S. C. RAPSON, and A. J. HEFFER (trading as the Suburban Electrical and Maintenance Co.), 2, Plough Yard, Shoreditch, E., electricians.—Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2, released August 10th.

C. L. BURRILL and A. J. HEFFER (trading as above).—Discharged July 19th, subject to consenting to judgment for £25 being entered against them by the trustee. (£25 paid to the trustee in lieu of entering up judgment.)

A. M. WILLMORE, 45, King Street, Brighton, electrical and radio engineer.—First and final dividend of 2s. 2d. in the £, payable September 23rd, at the Official Receiver's Office, 12a, Marlborough Place, Brighton.

H. MILNES (trading as H. Milnes & Son), 6, Trinity Street, Huddersfield, plumber and electrical engineer.—First and final dividend of 1s. 11d. in the £, payable September 28th, at the Trustee's office, 6, New Street, Huddersfield.

HARRIETT SPENCER (trading as Spencer & Son), 30, Watergate, Grantham, wireless and cycle dealer.—First and final dividend of 4s. 7½d. in the £, payable September 26th, at the Official Receiver's offices, 4, Castle Place, Nottingham.

Company Liquidations.

BRUNSWICK ENGINEERING CO., LTD., 9, Brunswick Place, City Road, London, N.1, electrical and mechanical engineers.—A meeting of creditors was held recently, when a statement of affairs, prepared by Messrs. Merrett, Son & Street, C.A., 41, Finsbury Square, E.C.2, was submitted, disclosing liabilities of £2,849 and assets of £1,587, from which had to be deducted £204 for preferential claims, leaving net assets of £1,383, or a deficiency as regarded creditors of £1,465. The issued capital was £1,602, so that there was a total deficiency of £3,067. The company was formed to take over an existing business. The principal shareholder was then Mr. Lake, and the company traded successfully under his direction until the commencement of 1926. Mr. Lake, having other business which demanded his attention abroad, then appointed a manager, and about three months ago disposed of his shares to Mr. A. E. Harris. Shortly after that it became apparent that the company was short of liquid assets, and on investigation it was found that it had tendered for contracts below cost, and on one contract alone a loss of about £1,000 had been sustained. It appeared that the business had been carried on at considerable loss. The liquidator stated that two creditors for small amounts had already levied execution, and that there were four others in a position to do so. He accordingly advised Mr. Harris that the only method by which the rights of the general body of creditors could be preserved was by placing the company in liquidation. That was done on August 29th last, notwithstanding that on the face of it the company appeared to be quite solvent. The liquidator added that in his opinion if the business was broken up it would probably only realise somewhere in the neighbourhood of 10s. in the £, but orders were coming in which showed a good rate of profit, and the staff was fully employed, and it was hoped to dispose of the business as a going concern. It was resolved by a large majority that the matter should be left in the hands of Mr. H. C. Merrett, C.A., the present liquidator, together with a committee of inspection of four of the principal trade creditors. The following are creditors:—

	£		£
Armstrong & Co., Ltd., J.	113	General Electric Co., Ltd.	35
Albion Iron & Wire Co., Ltd.	24	Holmes & Co., J. H. ...	59
Aston, D. A.	20	Henley's Telegraph Works Co., Ltd., W. T. ...	151
Benjamin Electric, Ltd.	41	K. & C. Engineers Supply Co., Ltd.	23
Bergmann Electric Co., Ltd.	56	Medway's Safety Lift Co., Ltd.	34
B.K.B. Electric Motors, Ltd.	62	Memford, Ltd., A. G. ...	37
Clark, Hunt & Co., Ltd.	21	Maskall & Sons, R. ...	55
Courtin & Walsh, Ltd. ...	112	Muller, Hans	76
Dwyer & Co., P. L. ...	251	Sloan Electrical Co., Ltd.	43
Edwards, Ltd., F. J. ...	65	Whincop & Son	30
Fry, Ltd., W. S.	45	Young & Cooper	42
Falk, Stadelmann & Co., Ltd.	21		

SHERINGHAM DAYLIGHT CO., LTD., 9, Basinghall Street, E.C., electric lamp manufacturers.—Winding up voluntarily. Liquidator, Mr. G. S. Farebrother, 9, Basinghall Street, E.C., appointed August 29th. A meeting of creditors was held on September 15th, when the liquidator presented a statement of affairs which showed liabilities of £450, all due to unsecured creditors. The net assets were £75, leaving a deficiency of £375. The company was formed in 1926 to take over a business which had been carried on successfully by Mr. Phillipson. The shares issued amounted to 3,750 shares of £1 each, and 5,000 ordinary shares of 1s. each. The ordinary shares were allotted to Mr. Phillipson as part of the purchase price. The remaining capital was put in by Mr. Allen, a director of the company. The total loss since the inception of the company was £2,136. The directors considered the advisability of putting the company into voluntary liquidation, but in the meantime certain parties had approached the company with a view to taking over the business. Negotiations were entered into, but they had fallen through. Mr. Allen had received a salary of £450 per annum, but had paid into the business £3,700, and Mr. Phillipson had received no salary, but had advanced money from time to time. The creditors decided that the estate should remain in the hands of the present liquidator. The following are creditors:—

	£		£
Aerograph Company ...	66	Miles, J., & Co.	30
Dugdill, J.	30	Troughton & Young ...	23
Ford, —	40	General Electric Co., Ltd.	26
Burdy, —	60	Solicitor	75

ASTON CROSS FOUNDRY CO., LTD. (also trading as The M.A.P. Co.), 246, Great Lister Street, Birmingham.—The first meeting of creditors was held on September 9th at the Official Receiver's office, Birmingham. The ranking liabilities amounted to £11,679, and there were no assets. The company was promoted in 1923 for the purpose of carrying on business as engineers and ironfounders at Upper Thomas Street, Aston, but later engaged in the business of manufacturing motor and wireless parts. The Official Receiver stated that the company appeared to have been in financial difficulties since December, 1924. The failure was attributed to foreign competition, loss on production of wireless parts, and costs of manufacture of tools for a patent condenser which was produced under a licence granted to the company. The meeting was adjourned until September 16th, when a resolution was passed that no

application should be made to the Court to appoint a liquidator in place of the Official Receiver, or to appoint a committee of inspection, and the matter will therefore remain in the hands of the Official Receiver.

RADIO EQUIPMENT CO., LTD.—Liquidator, Mr. R. L. Tayler, Coventry House, South Place, E.C., released July 26th.

ACE BATTERY CO., LTD.—A meeting of members is called for November 14th at the offices of Messrs. Sands & Flinders, Victoria Street, Nottingham, to hear an account of the winding up from the liquidator, Mr. H. Sands.

Private Arrangements.

CHARLES EVANS, LTD., 32, Market Street, Wigan, dealers in electrical goods, &c.—At a recent meeting of creditors at Wigan, a statement of affairs was submitted disclosing liabilities of £1,937, and total assets of £1,311, leaving a deficiency as regarded creditors of £626. The company was incorporated in February, 1923, for the purpose of taking over an existing business from Mr. Charles Evans. The purchase price was £1,500, which was satisfied by the issue of 1,500 ordinary £1 shares in the company, of which 900 were issued to Mr. Evans and 600 to Mr. J. Ball. These two gentlemen also held one subscriber's share each, so that the issued capital was £1,502. The trading of the company had resulted in losses. Mr. Ball retired from the directorate in May, 1926. The present position of the company was attributed to the general slackness following the coal dispute of 1926. The turnover for that year was £1,500 less than that of 1925. It was stated that it appeared that the bulk of the wireless stock was obsolete, while other lines were also out of date. It was stated that an offer of £650 in cash for the business had been made. It was decided to accept this offer. The following are creditors:—

	£		£
Enfield Cycle Co. ...	36	Efandem Co.	28
Wheeler, C. W.	106	Woolf, M. & A.	20
Sun Cycle Co.	43	Humber & Co.	38
Richardsons	47	Brown Bros.	29
E.W.R., Ltd.	43	Leicester Rubber Co. ...	28
Wells	166	Marston, J.	23
Regent & Richards ...	21	Towbkin, J.	24
Ball, A. & B.	814	Veico Cycle Co.	34

ALBERT HOLMES, trading as Holmes & Co., wireless dealers, &c., 508, Leeds Road, Bradford.—A meeting of creditors was held recently at Bradford, when a statement of affairs was submitted which disclosed liabilities of £471, all due to unsecured creditors. The assets were put at £145, leaving a deficiency of £326. A deficiency account was presented showing that the initial capital was £100, so that with the deficiency shown in the statement of affairs there was a total loss of £426. The debtor commenced business in March, 1924, with £100 capital, advanced by his mother, and still owing. She was, however, not claiming against the estate in respect of the amount. A full set of books had not been kept, nor had any accounts showing the position been prepared. It was decided that a deed of assignment should be executed in favour of Mr. W. Bell, 17, The Exchange, Bradford, as trustee. The following are creditors:—

	£		£
S.D.H. Manufacturing Co.	76	Charlton Metal Co. ...	22
Ward & Goldstone, Ltd.	48	Premier Accumulator Co., Ltd.	20
Auto Motor Products ...	46	Claremont, Johnson & Co., Ltd.	20
Ellison & Reeds ...	28		
Eastick, J. J., & Sons ...	22		

Dissolution of Partnership.

APEX ELECTRIC SIGN ADVERTISING CO., 6, Marriott's Court, Manchester.—Mr. R. S. Woods and Mr. B. Hallows Garside have dissolved partnership. Mr. Woods will continue the business.

Recent Contract.

SIR W. G. ARMSTRONG, WHITWORTH & CO., LTD., are building two more ships of the *Belnor* class, and have placed the contract for the water-heating equipment with the Bastian Meter Co., Ltd. The apparatus in the existing *Belnor* boats consists of a 100-gal., a 30-gal., and a 20-gal. storage geysers, with a total normal load of only 3¾ kW, and a peak load of 5½ kW.

Dispute in the Contracting Industry.

Last week informal negotiations were carried out between the executive of the Electrical Trades Union and the National Federated Electrical Association in connection with the strike of electricians employed by the Bective Electrical Co., Ltd. It will be remembered that the dispute centres around the continued employment by the company of a man who was expelled from the union. The executive of the E.T.U. recommended the men to return to work pending the settlement of the matter in question, but this they refused to do. Mr. Rowan, the general secretary of the union, thereupon pointed out that they were not only liable to be fined for defying the union's instructions, they were also violating an agreement to which the union had solemnly pledged itself. He warned them that their action might result in their being permanently unemployed. The *Daily Herald* states that the London District Committee of the union endeavoured to meet the N.F.E.A. on Monday last, but was informed that nothing could be done until the men returned to work.

Catalogues Wanted.

WHYGAR ELECTRICAL CO., electrical contractors, of 413a, Brighton Road, South Croydon, wish to receive catalogues of industrial and domestic electrical appliances, radio, and other manufactures.

The Approach of Winter.

Among the many reminders of the imminence of winter is one from the GENERAL ELECTRIC CO., LTD., which states that it is commencing a Press advertising campaign in connection with its pedestal heaters next week.

New Municipal Showroom.

Leyton Town Council has opened an electricity showroom at 280, High Road, Leyton.

The Brazilian Electrical Market.

Commerce Reports says that the market for electrical equipment in Brazil is a fast-growing one, and remarkable progress has been made in the sale of household devices operated electrically as well as of heavy electrical apparatus. Considerable American capital has entered Brazil recently, and a large share of it has been invested in public utilities which were purchased from their Brazilian owners. An American manufacturer has set up a thoroughly modern works for the production of electric-light bulbs in Rio de Janeiro, thus being in a more advantageous position to meet European competition than would be possible otherwise.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price September 20th	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3½d. to 3¾d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3¼d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£107 to £112	...
b	,, Wire ... ... per lb.	1/6 to 2/-	...
b	,, Sheet ... ... ,,	1/3 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£251	£3 dec.
	Grade II ... ... ,, ,,	£173	£2 dec.
	Grade III ... ... ,, ,,	£88	£1 dec.
c	Brass (rolled metal 2' to 12' basis) per lb.	9¼d.	...
c	,, Tubes (solid drawn) ... ... ,,	11½d. to 11¾d.	...
c	,, Wire, basis ... ... ,,	9¾d.	...
c	Copper Tubes (solid drawn) ... ,,	1/0½	...
c	,, Bars (best selected) ... per ton.	£96	...
c	,, Sheet ... ... ,,	£86	...
c	,, Rod ... ... ,,	£86	...
d	,, (Electrolytic) Bars ... ,,	£62 10s.	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ... ,,	£72 10s.	...
d	,, ,, H.C. Wire per lb.	9¼d.	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/3	...
h	Gutta-percha, fine ... ... ,,	8/-	...
h	India rubber, Para fine ... ... ,,	1/2½	1½d. dec.
l	Iron Pig (Cleveland No. 3.) ... per ton.	73/-	...
l	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£23 5s.	5s. dec.
k	Mercury ... ... per bot.	£21 15s. to £22	...
e	Mica (in original cases) small ... per lb.	3d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up.	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/3	...
p	,, ,, rolled strip & sheet ,,	1/2½	...
p	,, ,, wire... ... ... ,,	1/3½	...
o	Platinum ... ... per oz.	£14 10s.	...
d	Silicium Bronze Wire ... ... per lb.	10½d.	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£277 10s. to £278	£10 to £10 10s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	4/9	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their lead statement, dated September 17th, Messrs. James Forster & Co. reported a rise of 8s. 9d. per ton on the week, which induced a certain amount of buying by consumers in this country, chiefly for prompt delivery. Supplies are still greater than the demand; the only remedy is a general curtailment of production, and this measure seems, at last, about to be adopted. The Broken Hill Proprietary Co. has announced its intention to cease production at its mine on September 24th.

Book Notices.

"Electricity in the Home" is the title of a booklet published by Messrs. H. A. Smith & Son, Ltd., Whitefriars Press, Coventry, to encourage the use of electrical appliances for domestic purposes; its sub-title is "What you need to know simply explained," and it purports to put into simple language the fundamental principles of electrical distribution. In the main the substance is sound, but there are a few technical errors in the text. Space is provided for the advertisements of manufacturers of electrical appliances, who are invited to obtain copies for distribution.

"*Journal* of the Institution of Electrical Engineers." Vol. LXV. No. 369. September, 1927. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

The Cripplegate Institute, which is situated in the heart of a busy part of the City, has issued a 36-page booklet containing the programme of lectures, dramatic and other entertainments, dinner hour concerts, &c., which are to be given during the 1927-28 session.

"Materials and Design in Turbo-Generator Plant." By O. Lasche. Third edition. Enlarged and rewritten by W. Kieser. Pp. xi+204; figs. 363. London: Oliver & Boyd. Price 24s. net.

CORRECTION.—In our last issue, on page 466, under "Book Notices," there appeared an announcement of Messrs. Chapman & Hall's book, "The A.C. Commutator Motor," by C. W. Olliver. We regret that by an error the author's name was inserted as "C. Wolliver."

Malayan Electrical Imports.

The total value of imports of electrical goods and apparatus into Malaya during the first half of this year was £414,915, as compared with £232,514 during the corresponding period of 1926.

Lighting and Power Notes.

Alderley Edge and Wilmslow.—PURCHASE OF UNDERTAKING.—Messrs. Edmundson's Electricity Corporation, Ltd., has informed the Urban District Councils of its agreement to the purchase of the undertaking by them on the terms subject to the conditions of the resolutions passed on July 25th.

Barnsley.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £9,000 for extensions to mains and the erection of a sub-station.

Birkenhead.—ELECTRICITY SUPPLY.—The Town Council has received the consent of the Ministry of Transport to the use of overhead lines in the urban district of Neston and Parkgate, the rural district of Wirral, and the parish of Prenton, for the supply of electricity under the Birkenhead Orders, 1920-1925.

Boston.—STREET LIGHTING.—The Town Council has sealed an agreement with the Boston and District Electric Supply Co., Ltd., for street lighting for a period of five years.

Bo'ness.—LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £1,000 for extensions at the burgh electricity works consequent upon the Carriden Coal Co., Ltd., taking a supply of power for its colliery. The necessary wayleave for the cables has been granted.

Bredbury and Romiley.—REDUCTION OF CHARGES.—The Urban District Council has reduced the minimum charges for electricity from 12s. 6d. per winter quarter and 8s. 4d. per summer quarter to a minimum charge of 3s. 9d. per quarter for the whole year.

Bromley (Kent).—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £140,000 for electricity purposes.

Clayton (Yorks.).—ELECTRICITY SCHEME.—The Urban District Council has received sanction to proceed with its electricity scheme and to the necessary loans. The tenders for cables have been given to British electrical firms. It is hoped that a supply will be available by the end of the year.

Dover.—ELECTRICITY IN BULK.—The Town Council is to apply for powers to change the frequency of supply, and for sanction to borrow £20,500 in connection with a bulk supply of electricity from the Folkestone Electricity Supply Co., Ltd.

Dumfries.—ELECTRICITY CHARGES.—The Town Council has fixed the charges for electricity as follows:—Lighting: 7½d. per kWh; power, 3½d. per kWh. A sub-committee has been appointed to consider ways and means for increasing the number of consumers.

Glenafton.—INSTITUTION PLANT.—The Committee of the Sanatorium has applied to the Ayrshire County Council for a loan of £3,000 for installing electrical plant and X-ray apparatus at the sanatorium.

Harrogate.—LOAN.—The Town Council is applying for sanction to a loan of £16,000 to cover the cost of the provision of an electricity supply in the area authorised by the Harrogate Electric Lighting (Extension) Order, 1915.

Kingussie.—ELECTRICITY SCHEME.—Work has commenced on the Grampian Electric Supply Co.'s scheme for providing an electricity supply for the town. The erection of the power house and distributing station is in progress, and the overhead wires are being placed in position. It is expected that a supply will be available next month.

Leatherhead.—ELECTRICITY CHARGES.—The Leatherhead and District Electricity Co., Ltd., has applied for sanction to alter the maximum charge for electricity from 1s. per kWh, with minimum charges of 15s. for the winter quarters, and 10s. for the summer quarters, to 10d. per kWh and 12s. 6d. and 8s. 4d. respectively.

Liskeard.—SPECIAL ORDER.—The Liskeard Gas and Electricity Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in the borough.

London.—HACKNEY.—The Stoke Newington Borough Council has inquired whether the Electricity Committee can supply it with a bulk supply of electricity as from March 31st, 1928. The Committee has recommended that an agreement be entered into for a bulk supply, to be terminable on five years' notice. Hackney Borough Council will provide duplicate mains from Millfields Road power station to Edward's Lane sub-station, Stoke Newington, and the necessary apparatus to give a supply up to a maximum demand of 5,000 kVA, 50 cycles, 3-phase, at a pressure of 10,250 V. Stoke Newington is to pay the loan charges on the capital to be expended and to pay for electricity supplied. The agreement is subject to the approval of the Electricity Commis-

SHOREDITCH.—The Lighting Committee has recommended that application be made for sanction to a loan of £8,570 for the supply, laying, and jointing of approximately seven miles of cable.

Mold.—LOAN.—The Urban District Council has applied for sanction to a loan of £6,000 for electricity extensions.

Northern Ireland.—BANGOR (CO. DOWN).—The sub-committee recently appointed by the Urban District Council to consider and report on the advisability of an electrical scheme has submitted an interim report. The Council resolved that the chairman of the sub-committee should consult with the chairman of the Electricity Committee of Belfast Corporation with a view to ascertaining if the services of the city electrical engineer, Mr. Whysall, would be available to advise in the matter.

BALLYBAY (CO. MONAGHAN).—The Town Council has accepted the local Electric Supply Co.'s offer to supply electricity for lighting purposes at 1s. per kWh.

LISBURN (CO. ANTRIM).—The Urban District Council has consented to the granting of a general licence to the Lisburn Electric Supply Co., Ltd., for the supply and distribution of electricity in the district.

COLERAINE (CO. LONDONDERRY).—The Urban District Council has decided to proceed with a public electricity scheme and to apply for sanction to a loan of £10,500 for that purpose.

Nottingham.—PRICE REDUCTIONS.—The Electricity Committee has announced the following reductions in the charges for electricity as from the end of the present month:—Lighting: From 5½d. to 5d. per kWh. Power: From 1½d. to 1d. per kWh. Maximum demand rate: From 7½d. and 2½d. to 7d. and 2d. per kWh. Traction supplies: From 1½d. to 1¼d. per kWh. The reductions are equivalent to a revenue of £40,000.

Portsmouth.—NEW SUB-STATIONS.—The Corporation Electricity Committee has authorised the erection of three sub-stations at Nutbourne, Prospect Road, and Eastney, at a total estimated cost of £1,600.

Rothesay.—EXTENSION OF SUPPLY.—The Town Council is to extend its mains to Wellpark, Craigmore, and to the Kyles of Bute Hydropathic at an estimated cost of £6,880.

Southend.—INQUIRY RESULT.—It is reported that the Electricity Commissioners have given their conclusions regarding the inquiry held by them ten months ago at Southend into alleged maladministration of the electricity undertaking. The Commissioners find that none of the allegations was proved, and that the innuendoes made during the inquiry were unfounded.

Swanscombe.—STREET LIGHTING.—The Urban District Council has referred back to the Works Committee the question of converting the existing street lamps from gas to electricity. The Kent Electric Power Co. has submitted a scheme, at a cost of £799, with £122 per quarter for electricity, on a seven years' contract.

Swindon.—NEW PLANT.—The Town Council has decided to install additional plant at the electricity works, at an estimated cost of £61,750.

Tilbury.—INAUGURATION OF SUPPLY.—The Town Council's electricity scheme was to be formally inaugurated on September 21st.

Torquay.—EXTENSION OF SUPPLY.—The Corporation has received sanction to extend its area of electricity supply to a number of parishes in the rural districts of Newton Abbot and Totnes. It is proposed to make a charge of 1½d. per kWh, plus a standing charge, which will be 15 per cent. higher

than that made in urban areas. Where cooking is done by electricity a reduction in the "unit" charge will be made. In addition to these charges there will be an alternative flat rate of 1s. per kWh, with a minimum charge of 15s. per winter quarter and 10s. per summer quarter.

The Corporation is applying for powers to further extend its area of supply to parts of the rural districts of Buckfastleigh and Ashburton.

Uttoxeter.—ELECTRICITY IN BULK.—The Urban District Council has decided to ascertain if suitable terms for a bulk supply of electricity can be obtained from the Derbyshire and Nottinghamshire Electricity Power Co. The Council's consulting engineer, Mr. W. C. C. Hawtayne, is to interview the company and report to the Council.

Whitby.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £8,577 for the installation of additional generating plant at the electricity works.

Tramway and Railway Notes.

Aberdeen.—YEAR'S WORKING.—The report of the general manager and engineer (Mr. W. Forbes) on the working of the city tramway undertaking for the year ended May 31st last shows a total income of £143,906, as compared with £177,568 in the preceding year, the falling off in receipts being due to the general strike and the coal stoppage and to the reduction of fares. Working expenses decreased, however, from £142,692 to £117,577, leaving a gross profit of £26,329, as against £34,876, to which was added interest on investments of £3,849, and an unemployment grant of £1,316, making a total of £31,494. Capital charges absorbed £30,254, leaving a net surplus of £1,240, as compared with £759 in 1925-26. The capital expenditure during the year amounted to £29,746, and the total expended on the undertaking now stands at £642,298. The number of passengers carried decreased from 40,471,662 to 36,469,422, and the car miles run from 2,792,572 to 2,564,718. The receipts per car-mile fell from 15.17d. to 13.37d. The motor-omnibus and parcels services recorded a total net surplus of £4,878.

Costa Rica.—RAILWAY ELECTRIFICATION.—*Commerce Reports* says that the local newspapers state that the President has signed the contract for the electrification of the State railway. It is also stated that preliminary studies have been begun by the German contractors.

London.—TRAMWAY IMPROVEMENTS.—Experiments have recently been carried out by the Metropolitan Electric Tramways Co. with a view to replacing the existing type of trolley arm by new gear, which will permit of higher speeds with perfect safety. The device is a bow collector attached rigidly to the roof of the tramcar. The electrical energy is collected by a flat plate, 4 in. wide and 3 ft. long, the overhead wires being so arranged that the whole surface of the plate comes into use during a journey, wear thus being evenly distributed over its surface. It has been found possible to reduce the tension on the collector from 26 lb. on the present type to 10 lb.

Portsmouth.—TRACK RENEWALS.—The Corporation Tramways Committee has recommended various tramway track renewals, at a cost of £41,500.

Preston.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (general manager: Mr. H. Clayton) for the year ended March 31st last, record a total revenue of £82,887, as compared with £85,831 in the preceding year. Working expenses decreased from £67,723 to £65,467, leaving a gross profit of £17,420 (£18,108), to which was added bank interest of £327, making a total of £17,746. Capital charges absorbed the whole of the gross profit, and there was a net deficit of £2,701, as compared with a surplus of £2,366 in the previous year. The number of passengers carried decreased from 15,405,345 to 14,791,581, and the car-miles run from 1,214,842 to 1,169,094. The total revenue per car-mile increased from 16.956d. to 17.015d.

Telegraph and Telephone Notes.

Greece.—TELEPHONE CONCESSION.—Mr. Richard Turner, O.B.E., British Commercial Secretary at Athens, states that the Greek telephone service is still very deficient and the number of sets at present authorised is quite insufficient for the requirements. A concession for the reorganisation of the telephone service was obtained by a Belgian company, which was to have co-operated with a British company for the supply of the material, but the British company subsequently withdrew its support. The Belgian concern has since conceded its rights to a Greek group, which, it is said, is still trying to raise the necessary capital. This concession, which was granted under the Pangalos Government, figures in the list of concessions which are to be examined by the present Government.

Mexico.—TELEPHONE DEVELOPMENT.—A direct long-distance telephone line (602 miles) has been laid between Mexico City and Tampico. The contractor is the Compañia Telefónica de Mexico, which has also in hand further sections which will place Tampico in telephone communication with the United States and other distant points.—*Reuter's Trade Service* (Mexico).

New Pacific Cable.—AN AMERICAN SCHEME.—That the cable telegraph companies still have faith in their undertakings despite the development of "wireless," is once more demonstrated by the announcement of Mr. Newcomb Carlton, president of the Western Union Telegraph Co., that his Company proposes laying a modern cable between the United States and Japan to provide improved telegraph facilities between America and the Far East, at a cost of three million pounds. "The need for improved cable communication has been emphasised by recent events in China, which justifies this outlay," states Mr. Carlton. It is understood that the new cable will be of the "Permalloy" type, which will permit of the sending of five or six messages simultaneously, and will have a total carrying capacity of 2,500 letters (500 words) per minute. At the time when American and British troops were landing in China, three cable systems were available for the use of the British Government, while only one cable connects China with the United States; of course, a wireless circuit is in operation between San Francisco and Japan, *via* Honolulu, but it is stated that it works very irregularly. This discrepancy has caused considerable embarrassment to Washington, which is naturally anxious to keep in close touch with the Chinese situation. The present Pacific cable was laid by the Commercial Pacific Cable Co. (one of the Mackay Companies' subsidiaries) in 1902, and runs from San Francisco to Honolulu, thence to Midway Island and Guam, where it branches off to Manila and Yokohama. The Commercial Company's reply to this threatened competition is the purchase of the Federal Radio Telegraph Company, whose circuit it intends to operate between San Francisco and Japan, in addition to its present cable. It is understood that the purchase price was about a million pounds sterling, and that the new wireless circuit will be in operation before the new Western Union cable can be made. The Commercial Company's radio circuit will be operated on the "beam" system, now operating so successfully between Great Britain and the Dominions, a system which it is understood will also be shortly adopted on the Marconi transatlantic wireless circuit to New York, as well as to Buenos Aires.

The Telegraph Service.—During street digging operations in Cheapside on September 17th, a workman's pick penetrated one of the pneumatic tubes carrying telegrams from the Central Telegraph Office to outside post offices. The tube which was pierced was used to send telegrams from Ludgate Circus Post Office to the Central Telegraph Office, and all telegrams from Ludgate Circus had to be sent by hand.

The Telephone Service.—POLICE 'PHONE BOXES.—Six divisional police stations at Sheffield will shortly be offered for sale, as they will not be required when the police telephone box system comes into operation; it is anticipated that several other stations will be abolished in the near future. The new system provides for a hundred telephone boxes supplied with light signals by which headquarters can communicate with constables on their beats. The boxes will cost about £13 each, exclusive of lighting and erection charges; the telephones are supplied by the Post Office at the customary rental.

Radio Notes.

Australia.—ROYAL COMMISSION'S REPORT.—The *Daily Telegraph* states that the Royal Commission's report on wireless recommends that the control of broadcasting stations should remain in the hands of the Postmaster-General, subject to the administration of the Australian Wireless Committee, of which the Director of Postal Services is chairman. The report recommends co-operation between broadcasting stations to effect interchange and improvement of programmes; further research to determine the relative merits of higher power stations and relay stations; and that in the meantime no further licences be issued for new stations. It recommends that the location of existing stations be reviewed in consultation with the Defence Department; that the Commonwealth representative at the International Conference should advocate the limitation of the royalty chargeable for broadcasting copyright musical works; the reduction of the Amalgamated Wireless Company's charges and patent royalties; or, failing reduction, that the Commonwealth Government should acquire the company's privately-held shares. It recommends that all land coastal stations be re-acquired by the Postmaster-General from

the Amalgamated Wireless Company; that the Amalgamated Wireless Company be made liable for the payment of terminal charges; and that the company's position with regard to the establishment of further "beam" services be defined; that the relationship of the Postmaster-General and the company be more clearly defined; and that a special appropriation be provided to enable the present problems of wireless to be thoroughly investigated.

Regional Broadcasting. — DAVENTRY PLANT. — Owing to complaints that the signals of 5GB cannot be satisfactorily received in parts of Birmingham, the B.B.C. engineers recently conducted a week's test with a portable set installed in a motor-van, and the Corporation has issued the following statement:—"Using a seven-valve super-heterodyne receiver and a detector plate-current meter, it was established that the signal strength of 5GB throughout the Midlands was quite equal to the strength of reception of that station in the East End of London. Given suitable receiving apparatus, the programme should be picked up with equal facility in Birmingham." The B.B.C. states that not all listeners have adapted themselves to the new conditions, and their sets would appear to be not sufficiently sensitive. The engineers, however, will do their share towards improving reception of 5GB in the Midlands, and it is hoped, within the next three or four weeks, to bring into operation a better aerial system involving a bigger and improved aerial with increased strength of transmission.

It was revealed in last week's *Radio Times* that, so far, 5GB has, for various reasons, only been able to work on a power of about 14 kW instead of the 30 kW which it is hoped to employ in the future. To overcome the "shielding effect" of local masts, new aerials are in course of construction.

Jugo-Slavia.—NEW STATION.—*World-Radio* reports that a broadcasting station is to be erected shortly at Laibach. It will be ready for operation by next Easter and will be the largest in the country.

United States.—SCHENECTADY STATION.—According to the *Telegraph and Telephone Age*, high-powered radio broadcasting reached a new peak on August 4th, when a programme of WGY at Schenectady, N.Y., was broadcast at midnight from a new 100-kW experimental transmitter. This test marked the first time that 100 kW has been modulated and fed to an antenna for broadcast service. The Federal Radio Commission issued a special licence to operate with 100 kW for 30 days, and specified the period from midnight to 1 a.m., eastern standard time. Comparison tests were made of transmissions by the 100- and 30-kW transmitters. By means of this investigation, which is part of an extensive development programme, the radio engineers hope to improve the broadcast service.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—NEWCASTLE.—October 17th. Electricity Department. Outdoor switchgear and protective relays. (B.X. 3771.)*

MELBOURNE.—Commonwealth Postmaster-General's Department. October 25th. Plugs, switchboards, and instrument types. (B.X. 3780.)* Automatic telephone switchboard equipment for Hobart. (B.X. 3782.)* Switchboard instruments and instrument cords. (B.X. 3779.)*

November 22nd. Insulated wire. (B.X. 3832.)*

October 19th. Victorian Government Railways. Two 20-kVA cabin transformers. (B.X. 3793.)* Point detection transformers. (B.X. 3795.)* Insulated copper wire. (B.X. 3792.)* Track and line relays. (B.X. 3796.)*

December 12th. State Electricity Commission. Plant for the electrical precipitation of brown coal dust. (B.X. 3800.)*

Avonmouth.—October 10th. Port of Bristol Authority. Electric lighting installation for the transit sheds and granaries at the Royal Edward Dock. (See this issue.)

Barrow-in-Furness.—October 17th. Electricity Department. One 6,000-kW turbo-alternator with condensing plant, one water-tube boiler (60,000 lb. per hour) with mechanical stoker, or pulverised fuel plant, coal-handling plant and storage bunkers. (September 16th.)

Belfast.—October 1st. Electricity Committee. Steam, water, and other piping. (September 9th.)

Blackpool.—Electricity Department. E.h.p., h.p., and l.p., p.i.l.c. armoured cables for 12 months, house service boxes and cut-outs. (September 9th.)

Bognor.—October 17th. Bognor Gas and Electricity Co., Ltd. Rotary-convertor, switchgear, transformers, e.h.p. and l.p. cables. (See this issue.)

Bolsover.—Urban District Council. Wiring houses in the Council's district. (September 9th.)

Bray.—October 4th. Urban District Council. Erection of poles, cables, and wiring 68 houses. Specification from Mr. E. M. Murphy, surveyor to the Council, 27, Molesworth Street, Dublin.—*Irish Builder and Engineer.*

Bury.—October 12th. Electricity Department. Two water-tube boilers, with superheaters, economisers, mechanical stokers, coal- and ash-handling plant. (September 9th.)

Caersws.—October 4th. Newton and Llanidloes Board of Guardians. Additions to Institution, with laundry block and electric lighting installation. Mr. A. Stanley Hill, architect, Severn Square, Newtown, Mont. (Returnable deposit of £2 2s.)

Chile.—SANTIAGO.—November 14th. Chilean Public Works Department. Plant for the Iquique Pintados Railway. Two 4-motor, 40-ton and one 3-motor, 5-ton electrically-operated overhead travelling cranes, "Selson" type, one 700-kg. capacity "Otis" type cargo lift. (A.X. 5198.)

Dublin.—October 1st. Electricity Department. Transformers for 12 months. (September 9th.)

Edinburgh.—September 28th. District Board of Control. Electrical work required at kitchen staff house and engineer's house, Gogarburn, Edinburgh. Schedules from Mr. Stewart Kaye, architect, 14, Hill Street, Edinburgh.

October 8th. Corporation. Supplies for the Lighting, Cleansing, and other Departments for six months. Forms from 331, High Street.

Egypt.—CAIRO.—October 1st. State Railways, Telegraphs and Telephones. Supply of underground cables, from £E6,000 to £E6,300. Firms should communicate direct with the Chief Inspecting Engineer, Queen Anne's Chambers, Broadway, S.W.1.

October 26th. Ministry of Public Works. 7,500-kW thermal power station for Belgas. (B.X. 3748.)*

Galashiels.—October 1st. Town Council. Electrical work in connection with the erection of five blocks of houses. Schedules from J. & J. Hall, architects, Galashiels.

Greece.—ATHENS.—October 1st. Greek Red Cross. X-ray, cold storage, water pumping, &c. Installations, &c., for the new hospital and nurses' hostel. (C. 2411.)*

November 14th. Administrative Committee of the Port of Piraeus. Fifteen 2-ton harbour electric travelling cranes of the porch type. Specifications from the Commercial Department of the Greek Legation in London, 51, Upper Brook Street, W.1.—*Reuter's Trade Service.*

Halifax.—September 26th. Board of Guardians. Electrical fittings for six months. Mr. A. T. Longbotham, clerk, Carlton Street.

India.—September 28th. Assam-Bengal Railway Co., Ltd. Two 15-ton electric overhead travelling cranes. Specifications from the Company's offices, Bishopsgate House, 80, Bishopsgate, E.C.

London.—METROPOLITAN ASYLUMS BOARD.—October 5th. Alterations to the electric lighting installation at Queen Mary's Hospital, Carshalton. (September 16th.)

CENTRAL ELECTRICITY BOARD.—October 24th. 132,000-V overhead transmission lines for the Central Scotland Electricity Scheme, 1927. (See this issue.)

METROPOLITAN WATER BOARD.—October 12th. Two 150-kW generators, switchboard, piping, &c., for Hampton pumping station. Chief Engineer, 173, Rosebery Avenue, E.C.

SOUTHWARK.—October 25th. Electricity Department. Cables for 12 months. (See this issue.)

Milford Haven.—October 17th. Electricity undertaking. Generating plant, switchgear, battery of accumulators, &c., underground and overhead mains. (See this issue.)

New Zealand.—WELLINGTON.—October 11th. Public Works Stores Department. Supply and delivery of 1,000—50,000-V insulators. (B.X. 3742.)*

November 29th. Two sets of transformer-oil drying and testing sets for the Waikaremoana scheme. (A.X. 5175.)*

November 29th. Valves, pipes, bends and branches. (A.X. 5182.)*

October 27th. Wellington Hospital Board. Electrical and oil fuel equipment. (B.X. 3781.)*

DUNEDIN.—November 12th. Corporation tramways. One overhead travelling crane, with 2-ton electric hoist. (A.X. 5179.)*

NELSON.—November 15th. City Council. 750-kW steam turbo-alternator and auxiliaries. (B.X. 3794.)*

Portsmouth.—September 28th. Board of Guardians. Electrical stores and lamps for three months. Mr. H. C. Morrell, clerk, St. Michael's Road.

South Africa. — JOHANNESBURG. — October 6th. South African Railways and Harbours. 200-V switchboard for the Durban workshops. (B.X. 3739.)*

October 20th. 265 perforated spark-arrestor mild steel plates (8 × 4 × ¼). (A.X. 5169.)* Suction gas engine and electric generator. (B.X. 377.)*

October 27th. One 3,600-h.p. electric freight locomotive. (A.X. 5205.)*

October 27th. Municipal Council. Water-proof wire. (B.X. 3825.)*

PRETORIA.—Union Tender Board. December 1st. Manual telephone exchanges for East London and Kimberley.

Southend-on-Sea.—October 3rd. Light Railways and Electric Lighting Department. Fuse boxes and troughs. (September 9th.)

Stafford. — September 26th. Staffordshire Education Committee. Installation of electric light and power, King Edward VI School. (September 2nd.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Bradford.—Housing Committee. Accepted:—
Electric lighting installation for 326 houses on the Ecclshill housing estate (£1,189).—Taylor & Ashworth.

Buildings Committee. Accepted:—
Electric hoist at 46, Vicar Lane (£630).—Smith, Major and Stevens, Ltd.

Burnley.—Board of Guardians. Accepted:—
Electrical goods.—H. Thornton & Sons.

Grays.—Urban District Council. Accepted:—
Installation of automatic supply equipment at the electricity station (£3,500).—Crompton & Co., Ltd.

London.—AIR MINISTRY. Accepted:—
Special aircraft lamps (additional contract).—Siemens Electric Lamps & Supplies, Ltd.

HACKNEY.—Works Committee.
Renewal of the batteries of two electric vehicles (£345).—Chloride Electrical Storage Co., Ltd. (Recommended.)

ST. PANCRAS.—Contracts and Stores Committee.
Electric lighting installation for the staircases and flats now in course of erection in Wolcott Street, 604 points, with plain drop pendant and 9-in. opal conical shades:—

T. H. Smerdon. (Recommended.	**£997**
Sims & Sims	1,066
H. G. Toms & Sons	1,148
E. S. Russell & Co.	1,480

STOKE NEWINGTON. — Electricity Committee. Recommended:—
Twelve months' supply of distributor and service cables.—W. T. Henley's Telegraph Works Co., Ltd.
Meters for 12 months.—Reason Mfg. Co., Ltd., Measurement, Ltd.

Macclesfield.—Rural District Council. Accepted:—
Installing electric lighting at the offices (£98).—V. R. Brees.

Newport (Mon.).—According to the daily Press the Tramways and Electricity Committee has recommended the acceptance of a Swiss tender at £34,000 for a 10,000-kW turbo-alternator and condenser. The lowest British tender was £34,702. It is stated that the alternator and condenser will be made in Great Britain.

Swansea.—Education Committee. Accepted:—
Electric lighting installation at the following schools:—Brynhyfryd (£420), Brynmill (£315), Hafod (£393), Tirdeunaw (£119), R. G. Cooper; Cadle (£140), Rutland Street (£190), Magneto Rep. & Winding Co.; Danygraig (£393), Laudray & Chapman; Gendros (£224), Davies & Co.; Lonlas (£110), O. Williams; Oystermouth (£215), T. C. Sprague; Plasmarl (£330), Waunwen (£247), J. D. Williams; St. Thomas (£480), H. N. Kirk; Girls' Intermediate (£353), Cole & Day.

Electricity Committee. Recommended:—
Current limiting device for 10,000-kW set (£211).—British Brown, Boveri Company, Ltd.

Swansea Improvements and Tramways Co. Accepted:—
Electrification of the Mumbles Railway:—Electrical equipment of the sub-station.—Metropolitan-Vickers Electrical Co., Ltd.

Wolverhampton.—West Midlands Joint Electricity Authority. Accepted:—
Works switchboard in connection with the extension of the Birchills generating station (£1,939).—Ferguson, Pailin, Ltd.

Forthcoming Events.

Birmingham Electric Club.—Friday, September 23rd. Grand Hotel, Birmingham. 7 p.m. "Light and Colour." Mr. R. G. Williams.

National Radio Exhibition.—September 24th to October 1st. Olympia, W.

Electrical Power Engineers' Association (Southern Division).—Wednesday, September 28th. Institution of Electrical Engineers, London, W.C. 7 p.m. "The Use of Meters (non-electrical) in Power Stations." Mr. J. L. Hodgson.

Faraday Society.—Wednesday, September 28th. Burlington House, W. 8 p.m. Ordinary meeting.

British Electrical Development Association.—Friday, September 30th. Royal Society of Arts. 7.30 p.m. "E.D.A. Circle Campaign, 1927-28." Mr. V. W. Dale.

E.D.A. Circle Campaign.—October 3rd. 1 p.m. National luncheons in London, Liverpool, Glasgow, Manchester, Birmingham, Cardiff, Belfast, Newcastle, Bath, Hull, Grimsby, South Shields, and Whitley Bay. Other Press functions at Hampstead, Ashford, and Greenock.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

LOCKDROP indicators.
MEG non-association cables.
An instrument known as the RAILOMETER.

Notes.

Fatalities.

On Friday last week a gardener named Joseph Hopson was at work in a garden at Hampton when he came into contact with electric wires and was killed. At the inquest on Saturday evidence was given that he was heard groaning, and was found with a lilac bush and two wires across him. Help was called, and Mr. Lawrence Foreman said he saw the man lying in a hole in the ground, with wires across his chest; he was blue in the face and was frothing at the mouth. The witness removed the wires with the aid of a tobacco-pouch. The owner of the house, Mr. E. Seymour, said the wires led from the house to the garage; they were tied to the shrubs, which were quite firm.

Dr. Llewellyn said the man had an enlarged heart, but died as the result of an electric shock; the state of his heart would not render him more liable to death.

Mr. M. Farrer, of East Molesey, manager of the Twickenham and Teddington Electric Supply Company, said he found that the lead covering of the wires was alive, and apparently was not earthed anywhere. At one place the lead was damaged, exposing the insulated wires, and the defect would enable water to get in under the lead sheathing and deteriorate the insulation.

The jury returned a verdict of "Death by Misadventure," and expressed the view that the wires should not have been left so close to the ground when a workman was there alone; they should have been fixed on a post.

At the inquest last week on the death of A. H. Tomblin, mentioned in our last issue, it was stated that the deceased was found lying in a pool of water, holding in his hand an electric lamp bulb, which had been connected by a flexible lead to a lampholder. Slight shocks had previously been received from the bulb and from the flexible. Mr. H. D. Irons, electrical inspector to the West Ham Corporation, had examined the portable lamp, and found a wire loose at the back of the terminal; people, he said, were always advised to have holders of an insulated pattern. This one was not safe. The jury returned a verdict of "Death by misadventure arising from a shock received from defective fittings."

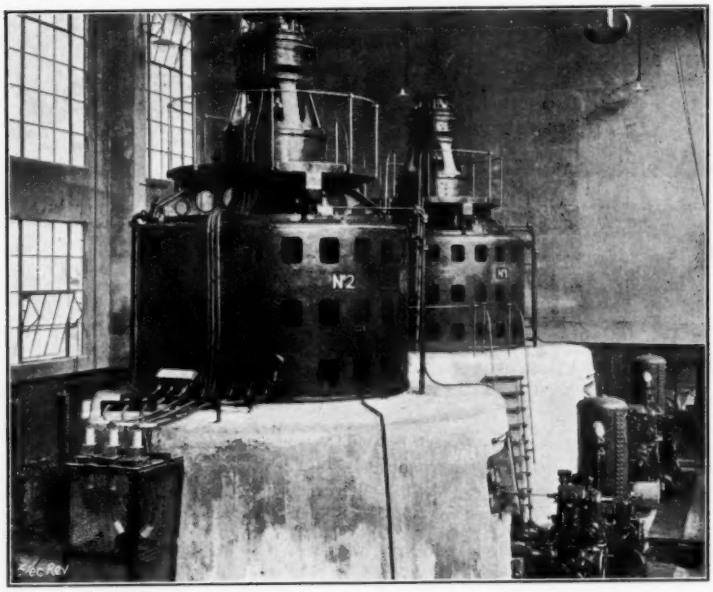
Diesel-Electric Tankers.

The Atlantic Refining Co. is having three of its steam-driven tankers converted to Diesel-electric drive, says the *Motor Ship*. The first has been completed; she was the *J. M. Connelly*, but is now named the *Point Breeze*, 364.9 ft. long, with a beam of 51 ft. and a depth of 29 ft. 5 in., the deadweight capacity being about 7,000 tons. Three Ingersoll-Rand engines of 850 b.h.p. are coupled to dynamos of 525 kW, which they drive at 225 r.p.m. Power is supplied in series to a 750-volt double-armature motor of 1,800 h.p., which drives the propeller at 90 r.p.m.

Stonebyres Hydro-electric Plant.

We learn that two 4,000-h.p. water-driven electric generators with main switchgear and booster transformers, all manufactured by the English Electric Company, Ltd., have been recently put into commercial service in the Stonebyres power station of the Lanarkshire Hydro-Electric Power Company. Each set consists of a vertical reaction turbine driving an 11,000-volt, three-phase alternator at 375 r.p.m. The erection of two 7,000-h.p. "English Electric" sets at the Bonnington power station of the same undertaking is nearing completion.

It is noteworthy that these are believed to be the first large water-turbine generator sets in Great Britain to be manufactured in their entirety by a British firm, and are also the first large sets of the vertical type to be installed in this country.



"English Electric" Generating Sets at Stonebyres.

The Lanarkshire Hydro-Electric Power Company owed its inception largely to the energy and foresight of Mr. E. T. Goslin, general manager of the Clyde Valley Electric Power Company, and to Messrs. Buchan & Partners, of Edinburgh, the consulting engineers under whose supervision the works are being executed.

"The Model Engineer" Exhibition.

During this week the ninth "Model Engineers'" Exhibition is in progress at the Royal Horticultural Hall, Westminster; to-morrow is the last day. A feature which has aroused the interest of the public is an electric railway on which the trains are started, stopped, or reversed by the sound of the voice of the inventor, Major Raymond Phillips.

Faraday House Old Students' Association.

The annual dinner of the Old Students' Association will be held at the Savoy Hotel, London, on Friday, October 28th; Mr. J. Francis Watson, technical manager, Callender's Cable and Construction Co., Ltd., who is president of the Association, will be in the chair.

Educational.

UNIVERSITY COLLEGE, UNIVERSITY OF LONDON.—Faculty of Engineering.—The new session commences on Monday, October 3rd.

NORTHAMPTON POLYTECHNIC INSTITUTE.—Electrical Engineering and Civil and Mechanical Engineering Departments (Evening Classes).—The new session commences on Monday, September 26th.

Engineering Day College.—The new session commences on Tuesday, October 4th.

Applied Chemistry Department.—The 1927-28 session commences Monday, September 26th. Evening courses are provided in fuels and combustion designed to meet the needs of chemical and power-station engineers. Full particulars can be obtained from the Principal. (See our advertisement pages to-day.)

ROYAL TECHNICAL COLLEGE, GLASGOW.—Day Classes.—The session commenced on September 20th. Evening Classes.—Session commenced September 19th.

MANCHESTER MUNICIPAL COLLEGE OF TECHNOLOGY.—Part-time Courses in Electrical Engineering commence Monday, October 3rd. Full-time courses.—New session commences Thursday, October 6th.

Appointments Vacant.

Shift engineer for the Darwen Corporation Electricity Department. Mains foreman and plumber-jointer for the Mexborough U.D.C. Electricity Department. Assistant engineer (Rs. 550 per mensem) for the Bhatpara Power Co., Ltd., Bengal. (See our advertisement pages to-day.)

Midland Electrical Engineers' Ball.

The committee has again decided to hold the Midland Electrical Engineers' Ball at the Grosvenor Suite, Grand Hotel, Birmingham, on Friday, November 18th, 1927. Mr. R. A. Chattock is president; Mr. W. H. Heaton, of the General Electric Co., Ltd., Witton, is chairman; and Mr. W. Y Anderson, 14, Dale End, hon. secretary.

B.E.S.A. Publication.

The British Standard Specification for Tungsten Filament Electric Lamps, No. 161, which was issued in 1924, has been revised, chiefly by the addition of four schedules for Traction, Vacuum Train Lighting, Gasfilled Train Lighting, and Gasfilled Bus Lamps. The modifications made are not numerous, the chief one in the general clauses of the specification being the addition of a switching on and off test. The figures in Table II of the Schedules for Vacuum and in Tables II and III for Gasfilled Lamps have been slightly modified. The dimensions of the bayonet cap, given in Appendix II, have also been modified, to bring them into line with the dimensions recently adopted by the International Electrotechnical Commission.

Copies of this specification, No. 161—1925, can be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 3d., post free.

Corrosion of Copper Pipes.

In a letter to *Nature*, of September 10th, Messrs. A. F. Dufton and F. L. Brady, of the Building Research Station, Garston, Hants., state that the presence of a metal tends to inhibit the corrosion of a more electro-positive metal. On the other hand, when a metal is coated with a material to which it is electro-negative, it is well known that intense local corrosion is apt to ensue if defects arise in the coating. Copper utensils are effectively protected by a coating of tin, the potential between copper and tin being about +0.4 volt. Tin, however, is not a suitable lining for copper water pipes. The explanation of this anomaly is that in a pipe the tin lining does not keep bright. On tarnishing it becomes more electro-positive and is ultimately electro-positive to copper. In this condition it is pernicious. The potential between copper and the tarnished tin lining of a pipe (in water) was found to be −0.1 volt: this pipe failed by local corrosion.

The Junior Institution of Engineers.

The forty-seventh session of the Institution opens on Friday, October 7th, when a lecture by Prof. Edwin Edser on "Lubrication" will be delivered. Thenceforward meetings will be held every Friday evening during the winter months and up to May of next year. Papers and lectures with informal discussions have been arranged for nearly every meeting during that period. Amongst the more important papers to be submitted during the session may be noted "Engineering Salesmanship"; "Management Graphics"; "Steam Accumulators"; "Pulverised Fuel"; "Automatic Electrical Sub-stations"; and the "Electrochemical Deposition of Metals." The inaugural meeting will be held on November 10th, when Sir Murdoch Macdonald, K.C.M.G., C.B., M.P., will deliver his presidential address, and the annual general meeting for the election of officers on November 11th.

Our Personal Column.

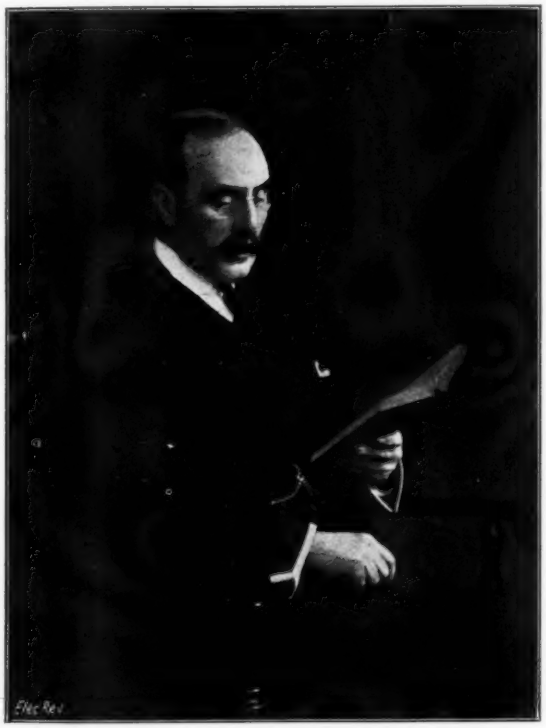
Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. J. H. WARD, Junr. (of Ward & Goldstone, Ltd., Manchester), son of Mr. J. H. Ward, of Alexander Park, Manchester, was married on September 15th, at West Didsbury, to FLORENCE, only daughter of Mr. and Mrs. J. H. SOMERVILLE, of West Didsbury.

Mr. G. DOUGLAS COE, who has been appointed electrical engineer to the Hereford Corporation, out of 67 applicants, at a salary of £800 per annum, commenced his career as a premium pupil under the Blackburn Corporation, and was assistant station superintendent there when the war broke

out. He served in the Royal Garrison Artillery, and was severely wounded at the battle of Arras in 1917. On being demobilised with the rank of acting major, he resumed duties at Blackburn, and in 1920 was appointed borough electrical engineer at Wrexham. He will take over his new duties at Hereford next month.

On September 15th the board of British Insulated Cables, Ltd., elected Mr. DANE SINCLAIR to the chairmanship of the company, in succession to the late Mr. James Taylor, J.P. He will combine with the chairmanship the office of managing director. Mr. Dane Sinclair has been associated with the company for a long period of years as general manager, and latterly as director also. Mr. Sinclair was born in Caithness in 1852. His early years were spent on the staff of the Telegraph Department of the North British Railway, and subsequently in the service of the Japanese Government, by whom he was appointed in 1875 as Inspector of Telegraphs. His five years' service in that capacity was marked by great and outstanding developments in that country, and on his completing his work the Mikado conferred on him the Distinguished Order of the Rising Sun, 3rd Class, in recognition of his exceptional services. On his return to Britain Mr. Sinclair was appointed engineer to the National Telephone



Jas. Bacon & Sons. [*Liverpool.*

Mr. Dane Sinclair.

Company for the Glasgow district. Shortly afterwards the three principal telephone companies of Great Britain were amalgamated into the large concern which retained the name of National Telephone Company, and Mr. Sinclair was asked by the directors of that company to furnish a comprehensive report on the equipment and working of the whole enlarged system. His report became the basis on which a complete reorganisation was carried out, and laid down the lines of policy on which the operations of that company were successfully conducted. Mr. Sinclair became London manager of the company, and in 1892 engineer-in-chief of the entire system. This position he held till 1902, when, on the invitation of the late Mr. James Taylor, on behalf of the board of directors, he accepted the position of general manager of British Insulated & Helsby Cables, Ltd. During the period of 25 years that he has been associated with the company, first as general manager and latterly as general manager and director, the business has grown and extended in magnitude and importance. The number of the company's employés has increased from 2,278 to 8,238, and work has been carried out in all parts of the world. Mr. Sinclair's activities have also found an outlet in other directions. In the development of the Automatic Telephone Manufacturing Co., which was originally a subsidiary of British Insulated Cables, his great experience and skill have been prominently displayed. The company now employs over 5,000 skilled men. On his recommendation the Strowger patents were acquired, and he has been active in promoting the use of this system for all automatic telephone equipment, both in Great Britain, where this apparatus is in successful use in 37 towns, and in various foreign countries. Mr. Sinclair's appointment to the chairmanship of the B.I. is a fitting consummation of his long years of keen service with the company, the success of which has been due, in no small measure, to his wide experience of affairs, coupled with his natural business acumen, and it may be confidently expected that under his sound guidance the company will continue to press forward on its prosperous career.

St. Pancras Borough Council Electricity and Public Lighting Committee reports that the addition of the 10,000-kW Brush-Ljungström turbine set at the King's Road station has increased the service rating capacity of the plant installed to 28,700 kW, and advances the classification of the undertaking from Class "F" to Class "G," which automatically increases the salaries of the technical staff. The Committee recommends that the salaries of the members of the technical staff be increased to the total amounts as follows:—Mr. J. T. BARON, deputy electrical engineer, £828; Mr. T. W. MERRY, station superintendent, £592; Mr. T. C. MUNFORD, mains superintendent, £542; Mr. A. F. WALTERS, mains assistant, £484; Mr. J. B. CLARKE, draughtsman, £484; Mr. R. NORREGAARD, boiler house superintendent, £452; Mr. W. A. BROWN, meter superintendent, £408; Mr. W. G. SUTTON, Mr. W. G. LEE, Mr. L. J. WINTON, and Mr. L. A. CREASY, shift charge engineers, £381; Mr. P. HARRIS, assistant charge engineer, £298; Mr. J. SHEPARD, assistant draughtsman, £298; and Mr. P. GERMAIN, mains assistant, £235.

Hackney Borough Council Establishment Committee recommends that Mr. W. BARHAM, constructional engineer, Electricity Department, be promoted to Grade 3 (Class G) of the N.J.B. Schedule at a salary of £592 per annum; that as from August 1st, 1927, Mr. A. G. HILLING, assistant district engineer, be promoted to Grade 4 (Class G) of the Schedule; and that as from the same date Mr. M. D. PRATT, mains engineer, be promoted to Grade 7 (Class G); and that the salary of Mr. A. C. BOSTEL, sales manager, Electricity Department, be increased to £700 per annum.

Mr. A. J. FULLER, Fulham Borough electrical engineer, has been elected chairman of the Bulk Supply Committee of the I.M.E.A.

The marriage took place on September 3rd, at Stockton-on-Tees, of Mr. ALEXANDER E. HARDY, A.M.I.E.E., of Kensington, London, W., and Miss ANNIE HEUGH, younger daughter of Mr. E. J. Heugh, of Stockton-on-Tees.

The marriage took place, at Whitchurch, Little Stanmore, Middlesex, on September 14th, of Mr. CHARLES FREDERICK GUTTERIDGE, of Rugby, electrical engineer to the Leicestershire and Warwickshire Electric Power Co., Ltd. (previously at the Rugby works of the British Thomson-Houston Co., Ltd.), and Miss KATHLEEN MARY BARKER, of Little Stanmore.

Mr. J. A. CRESSEY, M.A.I.E.E., who, in March last, took up his duties as engineer-in-charge to the Shanghai Municipal Electricity Department at Riverside power station, was in July appointed assistant control engineer to the same undertaking, a position which covers additional responsibility involving load dispatching, the control of plant operation, and all feeder operation upon the system.

Mr. HARRY BOOTH, O.B.E., formerly one of the Electricity Commissioners, was married on August 31st at Hampstead to IDA CONSTANCE, daughter of the late Mr. ALFRED WILLIAMS, of Hampstead.

Mr. G. F. MANSBRIDGE, O.B.E., M.I.E.E., recently retired from the position of Vice-Controller of the Post Office Stores, London, has joined the board of the Phœnix Telephone and Electric Works, Ltd.

Obituary.—MR. W. G. FULLER.—We regret to record the death, which occurred suddenly on September 15th in a nursing home, of Mr. Walter G. Fuller, editor of the *Radio Times* since January last year. He was 46 years of age. Abandoning medicine, he had for some years followed the profession of journalism, and at the beginning of 1925 he joined the staff of the British Broadcasting Company on the programme side. A year later he became editor of the *Radio Times*. The funeral took place on Saturday at Golder's Green. Those present included many members of the staff of the B.B.C. with whom Mr. Fuller had worked for between two and three years. The choral part of the service was rendered by the Wireless Choir, conducted by Mr. Stanford Robinson.

PROF. ING. G. MENGARINI.—The death recently occurred in Rome of Prof. Ing. Guglielmo Mengarini, one of the founders of the Italian Electrotechnical Association.

MR. T. C. THOMPSON.—The sudden death has occurred, at the age of 68 years, of Mr. Thomas C. Thompson, who was in charge of the machine shop at the works of the British Thomson-Houston Co., Ltd., Rugby. He had been engaged at the works for about 23 years.

MR. W. OWLETT.—The death has taken place, at the age of 60 years, of Mr. William Owlett, of Welling (Kent), who had for 25 years been on the London staff of Callender's Cable and Construction Co., Ltd.

MR. A. E. P. WITHAM.—The death is announced of Mr. A. E. P. Witham, electrician, of Frome, a former assistant manager of the Taunton Electrical Works.

Will.—MR. HARRY JACKSON, of Berners Street, W., and Wimbledon, electrical engineer, left £14,105 gross and £12,152 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Central Power Engineering Co., Ltd.—Private company. Registered September 12th. Capital, £3,000 in £1 shares. Objects: To acquire the business of an electrical engineer and contractor now carried on by A. J. Gregory at Wardrobe Court, 146a, Queen Victoria Street, E.C., as the "Central Power Engineering Co." The first directors are:—A. J. Gregory (permanent), 57, Rochester Road, Camden Town, N.W.1; A. L. Hodges, Brook House, Riseley, Beds. When the said A. L. Hodges acquires £1,500 shares he shall become a permanent director. Qualification of permanent directors, £1,500 shares; of other directors, one share. Secretary: A. L. Hodges. Solicitors: Hobbs & Brutton, Portsmouth.

Fluorads, Ltd.—Private company. Registered September 12th. Capital, £100 in 1s. shares. Objects: To acquire an invention made by F. W. Gillard and D. L. West, and to carry on the business of designers, inventors and manufacturers of and dealers in all kinds of illuminated, mechanical, revolving, swing, fixed, and other signs and apparatus and processes for internal and external lighting, &c. The permanent directors are:—F. W. Gillard, 86, Wolfington Road, West Norwood, S.E.27; D. L. West, Golf House, Mitcham Road, Tooting Junction, S.W.; D. M. Stone, address not stated. Solicitors: Downer & Johnson, 426, Salisbury House, E.C.2.

Electro-Metallurgical Ore Reduction, Ltd.—Private company. Registered September 13th. Capital, £15,000 in 10,000 10 per cent. participating preferred shares of £1 each and 100,000 deferred shares of 1s. each. Objects: To acquire and turn to account any invention relating to the treatment of complex ores or minerals; to acquire mines, mining rights, and metalliferous land in England or elsewhere. The subscribers (each with one preferred share) are:—J. Morison, 77, Bayston Road, Stoke Newington, N.16, clerk; E. M. Kelly, 45, Ribblesdale Road, Streatham, S.W.16, clerk. Registered office: 141, Moorgate, E.C.2.

A. E. White & Co., Ltd.—Private company. Registered September 14th. Capital, £2,000 in 500 preference and 1,450 ordinary shares of £1 each and 1,000 employés' shares of 1s. each. Objects: To carry on the business of electricians, mechanical engineers, &c. The permanent directors are:—A. E. White, 28, Clarence Street, York, electrical engineer T. L. Kay, Poppleton Hall, Ainsty, York, motor engineer Qualification of permanent directors, £200; of other directors £100. Registered office: 28, Clarence Street, York.

Jury's Electric Service, Ltd.—Private company. Registered September 7th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, contractors, licensors and licensees of and dealers in electrical materials, appliances, &c. The subscribers are:—S. S. Jury, 205, Gulson Road, Coventry, electrical engineer, one share; E. H. Edwards, Park View, Brays Lane, Coventry, accountant, two shares. S. S. Jury is the first director. Registered office: 135, Far Gosford Street, Coventry.

West Sussex Electrical Co., Ltd.—Private company. Registered September 12th. Capital, £500 in £1 shares. Objects: To carry on at Aldwick, Sussex, and elsewhere the business of an electric light company, to construct, lay down and fix cables, wires, lines, wireless aerials and installations &c. The first directors are:—J. C. Snelling, Channell View Felpham, Bognor (director of J. C. Snelling, Ltd.); A. E. Bantick, 119, Clarendon Road, Putney, S.W.15, clerk. Registered office: Gossamer Lane, Aldwick, Bognor.

Official Returns of Electrical Companies.

Sea Houses and District Electric Supply Co., Ltd.—Capital, £5,000 in £1 shares. Return dated May 7th, 1927. 2,785 shares taken up. £2,785 paid. Mortgages and charges, £328 8s. 6d.

Hindhead and District Electric Light Co., Ltd.—Issue on September 1st, 1927, of £100 debentures, part of a series already registered.

A. Reyrolle & Co., Ltd.—Capital, £400,000 in 40,000 preference and 360,000 ordinary shares of £1 each. Return dated April 21st, 1927. All shares taken up. £393,000 paid on 40,000 preference and 353,000 ordinary shares. £7,000 considered as paid on 7,000 ordinary shares. Mortgages and charges nil.

Kirkby Stephen Electric Light and Power Co., Ltd.—Capital, £1,200 in 110 preference shares of £10 each and 100 ordinary shares of £1 each. Return dated April 14th, 1927. All shares taken up. £1,000 paid on 100 preference shares. £200 considered as paid on 10 preference and 100 ordinary shares. Mortgages and charges, nil.

Tricity Restaurants, Ltd.—Two debentures dated September 5th, 1927, to secure £17,000 and £3,000, respectively, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: British Electric Transformer Co., Ltd.

Huntalite, Ltd.—Capital, £2,000 in £1 shares. Return dated March 30th (filed June 11th), 1927. 1,800 shares taken up. £1,500 paid. £300 considered as paid. Mortgages and charges nil.

Summit Electrical Co., Ltd.—Capital, £100 in £1 shares. Return dated February 28th (filed March 3rd), 1927. All shares taken up. £100 paid. Mortgages and charges nil.

S. H. Heywood & Co., Ltd.—Capital, £50,000 in £1 shares. Return dated May 28th, 1927. 31,999 shares taken up. £4,000 paid. £27,999 considered as paid. Mortgages and charges nil.

Hall Brothers (Manchester), Ltd.—J. R. Atkins, of 14, St. Anns Square, Manchester, ceased to act as receiver on August 4th, 1927.

Wondersigns, Ltd.—Issue on July 29th, 1927, of £600 debentures, part of a series already registered.

Qualters & Smith Bros., Ltd.—Satisfaction in full on August 9th, 1927, of mortgage dated January 10th, 1918, securing £750.

Melton Mowbray Electric Light Co.—Capital, £60,000 in £5 shares. Return dated May 6th, 1927. 9,600 shares taken up. £48,000 paid. Mortgages and charges, £19,100.

E. Saunders (Margate), Ltd.—Capital, £3,000 in £1 shares. Return dated July 10th, 1926 (filed June 11th, 1927). 20 shares taken up. £20 paid. Mortgages and charges, nil.

City Notes.

Anglo-Portuguese Telephone Co., Ltd.

Sir Arthur Stanley presided at an extraordinary general meeting, held at Winchester House, E.C., on September 14th, at which resolutions were passed approving a conditional agreement made between the company and the Connaught Trust, Ltd., increasing the capital to £1,100,000 by the creation of 300,000 new shares of £1 each (see ELEC. REV., September 9th, p. 435). Sir Arthur said that the recent change in the control of the company should be of material benefit to the company, its shareholders, and also to British trade. The new majority shareholders were largely interested in the telephone business, and they were now able to bring to bear on the company the best expert knowledge available in this country and on the other side of the Atlantic. The new board had already had the benefit of visits to Portugal of two experts of the highest standing (one American and one British), and their reports were optimistic and to the effect that the property was to a large extent a modern and well-equipped one, and that their area was capable of considerable expansion. As a result, a large number of additional telephones would be brought into commission with additional revenue which, under the old scheme of development, would not have happened except with a large capital outlay. This would now be avoided to a considerable degree. The substantial resources which they now possessed for the first time would lead to substantial economies. They were hopeful of success in their negotiations with the Portuguese Government regarding the revised concession. In expectation that the concession would provide for development on a profitable basis, they had drawn up a plan for reorganisation of capital, reducing the debenture stock or converting it into share capital. The company would be put into a position to raise capital for development much more readily than would be possible under its present financial position.

German Company.

Allgemeine Elektricitäts Gesellschaft.—The proposed increasing of the capital from 156,250,000 to 186,250,000 marks, was sanctioned on September 19th. The chairman, Herr Deutsch, said that the company's prospects were very favourable. The orders in hand were 70 per cent. above those at the corresponding date of last year, and the number of persons employed had reached 65,000.

Underground Electric Railways Co. of London, Ltd.

An extraordinary meeting has been called for October 6th to consider resolutions providing for the raising of the ordinary capital to £11,300,000. It is proposed to create 6,231,122 ordinary shares of £1 each. The new shares are required in connection with the recently-approved scheme of conversion for the 6 per cent. income bonds by which the holders consented to receive their interest less tax, instead of free of tax, and were given the option of exchanging their bonds for ordinary shares in the ratio of one share for each £1 1s. of principal secured by the bonds. The conversion, it is said, will save the company £95,000 per annum, equal to nearly 2 per cent. on the existing ordinary capital.

Eastern Telegraph Co., Ltd.

Second quarterly interim dividend on the ordinary stock, 2½ per cent., free of tax; dividend at the rate of 3½ per cent. per annum, less tax, on the preference stock for the quarter ended September 30th.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

Interim dividend of 5s. per share, free of tax, for the quarter ended June, 1927.

Direct Spanish Telegraph Co., Ltd.

The directors have declared the dividend for the half-year to June 30th, 1927, at the rate of 10 per cent. per annum on the preference shares and an interim dividend of 4 per cent., free of tax, on the ordinary shares.

British Aluminium Co., Ltd.

Interim dividend of 4 per cent. actual, less tax, on the ordinary shares, and one at the rate of 6 per cent. per annum, less tax, on the preference shares for the six months ended June, 1927.

British Electric Transformer Co., Ltd.

It is reported that the profit for the six months ended June 30th, was £17,143, as compared with £22,907 for the first half of last year.

Shawinigan Water and Power Co.

The company is offering 100,000 common shares at the price of $50 per share to existing shareholders in the ratio of one new share for each eleven held.

International Automatic Telephone Manufacturing Co., Ltd.

Interim dividend of 9d. per share on the ordinary shares.

Automatic Telephone Manufacturing Co., Ltd.

Interim dividend of 9d. per share on the ordinary shares.

British Insulated Cables, Ltd.

An interim dividend of 1s. per share, less tax, has been declared on the ordinary shares, as in 1926.

Parker, Winder & Achurch, Ltd.

An interim dividend of 6d. per ordinary share has been declared, as in 1926.

Marconi International Marine Communication Co., Ltd.

The directors have declared an interim dividend of 4 per cent. on the issued share capital.

Quebec Power Co.

A quarterly dividend of $2 per common share is announced.

Stocks and Shares.

MONDAY EVENING.

THE Government offers of 4½ per cent. Treasury bonds and of 3½ per cent. conversion stock had the effect of making investment securities a little dull. The heaviness is confined more particularly to what may be termed active stocks, and has not influenced the quotations of stocks and shares that lie almost entirely in the hands of permanent investors. Nevertheless, the tendency has to be noticed in explanation of an occasional reaction which has taken place amongst investment stocks and shares.

Brazilian Tractions.

The feature of the week is another record price in Brazilian Tractions, this having risen to 200, compared with 108 at the beginning of the present year. The reason for the incessant pressure to buy Brazilian Tractions may be partly explained by reference to the fact that the company's important telephone interests in Brazil are subject to a revision of rates every five years, and, according to market report, such a change may be effected in the present month. If the company were to put up its charges, this would make an important difference to profits, although it is well known that industrial companies, like the railways, hesitate to increase the prices of services rendered for public utility, in whatever country the companies are working.

The telephone portion of the Brazilian Traction Company's undertaking has been the subject, apparently, of desire on the part of the American corporation, which recently bought up the Montevideo Telephone Company, and, more lately, has been endeavouring to acquire the Oriental Telephone Company. In the case of the last-named, the International did not meet with much encouragement from the board of the company, while the Brazilian Traction Co. has proved equally unsympathetic to the offers made for the acquisition of its telephone system. The International, however, is very pertinacious, and possibly control might be obtained through the accumulation of a sufficient number of shares by purchase in the market and elsewhere to an extent that would give the buyers a voice in the management. Shareholders in the Brazilian Traction Company owe thanks to Sir Alexander Mackenzie, the president, for his outspoken advice that they should not exchange their holdings as they were invited to do some months ago, for shares in another company, and the directors are entitled to congratulation upon the vigorous manner in which they succeeded in advancing the company's interests while keeping the concern under their own control.

Further Falls in Cable Stocks.

Cable stocks have again gone back to some extent, in consequence of the fears aroused amongst stockholders lest the wireless system should supersede the submarine cables. It was the wide advertisement given to the opening of the Beam transmission to India which started the latest apprehension, and caused heaviness in Eastern ordinary, Eastern Extensions, Westerns and Globes. Appropriately enough, the Eastern company has declared its usual interim dividend of 2½ per cent. for the quarter, tax free, and the Eastern Extension the regular 5s. per share, tax free. Stock Exchange market opinion is that the cable companies have little more to fear nowadays from the competition of wireless than they had a dozen years ago.

The Eastern company is already in the wireless business. Working agreements exist between the cable and the wireless systems. There is plenty of traffic for both, and, although nobody would attempt to decry the marvels of the Beam transmission, or the developments of which it is capable, there is at the same time no necessity for stockholders in the cable companies to panic because of any alarm lest their business should be superseded by the latest methods. It is, of course, natural enough that, while this feeling of apprehension exists, there should be a slight pressure to sell the stocks. Eastern has gone back to 172¼, Globes are lower a 18¼, Eastern Extensions have shed ⅜ to 17½, coming level with Western Telegraphs, which at this price are half-a-crown down. It is a little curious to notice that Western Telegraphs, who are, as a rule, the Cinderella of the group, have suffered the least in the little shake-out that has occurred.

Wireless Shares.

Marconis themselves are unchanged at 21s. 3d. The price touched 22s., fell back to a guinea, and again strengthened a little. Marconi Marines hold their rise at 28s. 9d. The interim dividend of 4 per cent., less tax, is ¼ per cent. more than that of last year. The whole of the dividend for 1926 was 8¾ per cent., and optimists look for 10 per cent. in respect of the current twelve months. The final dividend for last year, paid four months ago, was 5 per cent., and to make 10 per cent. for 1927 it will be necessary for the final to be raised 1 per cent. next spring. Canadian Marconis are quiet at 6s. 6d., and the recent buying, which emanated in part from America, has subsided.

United River Plate Telephones have slipped back to £10. On the other hand, Automatics are better at 49s. 6d. The company has declared an interim dividend of 9d. a share, payable on the 1st of next month, which is the same rate as that of a year ago. International Automatic Telephone has announced an equal amount, payable on the same date, and the price of the shares is 43s. 6d. The deferred are 41s. 6d., and Telephone Manufacturing 7s. 3d. International Telephone deferred is quoted at 158; American "Tel. & Tel." is 180½.

Mexican Matters.

Anglo-Argentine Tramways first preference and the company's 5 per cent. debenture stock have both strengthened upon statements to the effect that there is probably nothing serious, after all, in the recent fear that friction has been aggravated between the Municipality and the company. Difficulties did arise some few weeks ago, but these, according to market talk, have been surmounted, and the first preference, offering as they do 8 per cent. on the money, have moved up to 3 7/16. British Columbia Electric stocks are good, and there has been a general improvement in Mexican

utilities. In the latter, the principal gainers are the preferred shares of the Mexican Light and Power Company, a rise of 5 lifting the price to 77½. The company's common new shares are 3½ up at 51, and a further gain of 2 points has lifted the first mortgage bonds to 74½. The amount of stock available for the prospective buyer has shrunk considerably, from which it would appear as though a good deal of quiet buying has taken place of late and that the purchasers have lifted their stock from the market. So long as Mexican matters remained under a cloud, the effect of such buying would not make itself manifest. With more favourable attention directed to the country, the previous absorption of stock becomes more obvious. As we have said before, there has been so much talk and so little sign of Mexican improvement during the past ten years that hesitation is naturally felt in regard to accepting too readily the conclusions of those who point to Mexico as being already a settled and a peaceful country. There is, however, no large amount of stock on offer, and the present holders are content to wait for yet higher prices. Moreover, it must be readily admitted that Mexico within the last year or two has given practical proofs of determination to introduce a régime of financial order and responsible government.

Perak River Hydro-Electric Power shares are better, the price rising to 10s. bid, as against the recent quotation of not much more than half that figure. The demand for the shares has been stimulated by the news, already mentioned here, that tin and rubber companies are showing willingness to take power from the Perak River Hydro-Electric, and that, when the construction of the big works is finished, there is a reasonable hope of the company being readily supported. The company's 7 per cent. participating debenture stock has moved up to 98½, at which the return on the money comes to £7 2s. per cent. without taking into account the participating rights which attach to the debenture stock. These entitle the stock to a further 2 per cent. after 8 per cent. has been paid on the preference shares.

Stock on Offer.

There is a couple of thousand pounds Electrical Finance and Securities 5 per cent. debenture stock obtainable at 99, the same amount of Lancashire United Transport and Power 6 per cent. first debenture stock at 97, and £5,000 Whitehall Electric 6 per cent. debenture at 103½, the last-named paying £5 16s. per cent. on the money, with interest in April and October. The present price is cum this payment. Victoria Falls and Transvaal Power ordinary shares have been a feature of strength, rising to 3 3/16 before the price gave way to 58s. 9d., the support being due to a possibility of the company declaring a bonus. Costa Rica Electric Light and Traction 5 per cent. first mortgage is 7 points higher at 67½.

Amongst home electricity issues, Urbans are a good market at 30s., being 1/16 up, and Edmundsons hold their recent rise to 37s. 6d. The London shares have scarcely moved. A decline of 2s. 6d. in London Electric preference lowered the price to 5⅞. Bournemouth and Poole, in the provincial group, rallied to 58s. 3d. Noticeable inquiry for shares in the power companies has left Yorkshires better at 31s., and Lancashires at 26s. 6d. Elsewhere, Provincial Tramways preference stand out with a 10s. rise to £4, the London Tramways descriptions showing no movement. Speculation is too much engrossed in artificial silk operations for it to both about tramway shares.

Underground's New Capital.

The Home Railway department is dull to the point of despondency. Undergrounds hold most of their strength, although Metropolitans are ¼ down at 56¼. The complete scheme has now been published by the Underground Electric Railways of London for the increase in the share capital rendered necessary by the conversion rights bestowed upon the company's income bonds. The share capital, it is proposed, shall be raised to £11,300,000, and the meeting to pass the requisite resolutions will be held on October 6th. It may be surmised that, on this occasion, all needful steps will be taken in advance to ensure a quorum at the meeting.

Manufacturing and Miscellaneous.

Rubber shares are flat because of a fresh shrinkage in the price of the produce. Amusement greeted the rumour that Mr. Henry Ford thinks of acquiring huge areas in Brazil upon which to grow rubber in competition with British-owned estates in the Middle East. The present parlous state of the rubber market fails, however, to amuse proprietors of rubber shares. The engineering division is steady. Babcocks held the substantial gain secured by the price last week. Vickers, on the other hand, are a trifle easier, and the general tendency of the iron and steel list is slightly irregular.

Metropolitan-Vickers preference have been strong, a gain of 3/16 lifting the price to 51s. 3d. Small advances occurred in General Electrics and India-Rubbers. English Electric preference recovered to 13s. 9d. The British Electric Transformer Company announces a profit of £17,143 for the half-year ended last June 30th, being £5,600 less than that in the corresponding period of 1926. The preference shares are unchanged at 18s. 3d. ex dividend. British Insulated remain at 76s. 3d., the interim dividend of 1s. per share, less tax—the same as that of a year ago—having no effect upon the price.

Share List of Electrical Companies.

	Nom. £	Dividend. 1925.	Dividend. 1926.	Price Sept. 19 1927.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	14	14	58/3	+1/16	4 15 9
Brompton Ordinary	1	10	8⅝	24.6	—	5 14 3
Charing Cross Ordinary	1	15	8½	25/6	—	5 9 10
do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	8¾	24/6	—	5 14 3
City of London	1	15	7½	29/3	—	4 15 9
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	30/6	—	5 5 0
County of London	1	15	7½	27/6	—	5 1 19
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	8	10	37/6	—	5 6 8
do. 7% Pref.	1	6	7	24/6	—	5 14 3
Elec. Supply Corporation	1	10	10	32/-	—	6 5 0
Kensington Ordinary	1	15	8	25/6	—	5 9 10
Lancs. Light and Power	1	7½	7½	26/6	+6d.	5 13 5
London Electric	1	10	8½	24/6	—	5 14 3
do. do. 6% Pref.	5	6	6	5⅜	−⅛	5 11 3
Metropolitan	1	11	6	30/-	—	4 13 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 8 6
Midland Counties	1	5½	6	21/6	—	5 11 7
Newcastle-on-Tyne Ordinary	1	7	5	22/-	—	4 11 0
do. 5% Pref.	1	5	5	17/6	—	5 14 3
do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10⅜	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 9 1
St. James' and Pall Mall	5	17½	8	25/6	—	5 9 10
South London	1	15	8½	25/-	—	5 12 0
South Metropolitan Pref.	1	7	7	1¼	—	6 8 0
Urban Ordinary	1	7	7	1⅛	+1/16	4 13 4
do. 6% Pref.	1	6	6	1 1/16	—	5 13 0
Westminster Ordinary	1	15	8½	25/-	—	5 12 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/3	+3d.	7 1 2
Yorkshire Elec.	1	8	8	31/-	+6d.	5 3 3
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	70	—	5 14 4
Metropolitan	,,	5	8	56½	−½	5 6 3
do. District	,,	3½	3½	62	—	5 12 0
Underground Electric	£1	Nil	1½	18/6	−6d.	1 12 7
do. do. Income	Bonds	6	6	102	—	*5 17 8
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	8	10	49/6	+9d.	4 1 0
Chili Telephone	5	5	6	7⅜	—	8 18 3
Eastern Extension	10	10	10	17½	−⅜	*5 14 3
Eastern Tel. Ord.	Stock	10	10	173½	−1	*5 16 0
Globe Tel. and T. Ord.	10	10	10	18½	−⅛	*5 9 10
do. do. Pref.	10	6	6	11	—	5 8 1
Great Northern Tel.	10	20	20	30½	—	6 11 0
Indo-European	25	8½	10	44½	—	*5 7 6
Marconi	1	Nil	Nil	1⅛	—	... ...
Marconi-Marine	1	7½	8¾	28/9	—	6 1 9
Oriental Telephone Ord.	1	12	12	52/6	—	*4 9 4
United R. Plate Tel.	5	8	8	10	−⅛	*4 0 0
Western Telegraph	10	10	10	17½	−⅛	*5 14 3
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref.	5	5½	5½	8 1/16	+1/16	8 0 0
do. do. 2nd Pref.	5	6	6	8 7/16	—	8 14 6
do. do. 5% Deb.	Stock	5	5	73½	+1	6 16 1
British Electric Traction Def./Ord.	,,	8	8	500	—	... ...
do. do. 8% Pref. Ord.	,,	6	8	120½	—	6 12 10
Brazil Traction	100	5	6	200	+5	3 0 0
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	90½	+1	5 10 6
do. do. Preferred	...	6½	6½	132½	—	4 12 4
do. do. Deferred	,,	8	8	165	+1½	*4 17 0
do. do. Deb.	,,	4½	4½	80½	—	5 5 7
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/-	—	Nil
London United Tram. Deb.	Stock	4	4	56½	—	7 1 7
Mexico Trams, 5% Bonds	—	5	5	72	—	6 19 0
Mexican Light Common	100	Nil	Nil	51	+3½	Nil
do. Pref.	100	Nil	Nil	77½	+5	Nil
do. 1st Bonds	—	5	5	74½	+2	6 14 3
Yorkshire (West Riding)	1	5	—	7/6	—	... ..
MANUFACTURING COMPANIES.						
Babcock & Wilcox		18	18	55/-	—	4 14 6
British Aluminium Ord.	1	12½	10	47/6	—	4 7 10
British Elec. Transformer Pref.	1	Nil	7	18/3	—	7 13 6
British Insulated Ord.	1	15	15	3 1/16	—	3 18 9
Brush Ord.	1	10	10	28/-	—	7 2 10
Callenders	1	15	15	3⅜	—	4 2 9
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 6
Crompton Parkinson Pref.	1	Nil	Nil	16/-	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	88	—	5 13 8
Electric Construction	1	10	7½	28/9	—	5 4 4
Enfield Cable Pref.	1	7½	7½	25/-	—	6 0 0
English Electric	1	Nil	Nil	10/-	—	... ...
do. do. Pref.	1	8	—	18/9	+1/16	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	7½	7½	32/-	+3d.	4 13 9
Henley	20	25	4 1/16	—	5 1 3
do. 4½% Pref.	5	4½	4½	4⅛	—	5 6 0
India-Rubber	1	5	5	20/6	+6d.	*4 17 7
Johnson & Phillips	1	17½	12½	50/-	—	5 0 0
Met.-Vickers Ord.	1	8	8	29/3	—	5 9 5
do. Pref.	2	8	8	2 5/16	+1/16	6 4 8
Siemens Ord.	1	7	7½	34/-	—	4 8 0
Telegraph Construction	12	10	10	27½	—	*4 7 4

* Dividends paid free of Income Tax.

Our Foreign Electrical Trade.

Electrical Exports and Imports during August, 1927.

THE Board of Trade returns of British exports and imports for August recorded a general improvement in which the electrical section shared. As our extracted figures indicate, the export total was over £100,000 higher than in the preceding month and in August, 1926. As compared with July, nine items increased in value, and only four were lower. The principal increase was shown by "other motors and generators," but this rise (£46,829) was considerably offset by a decline in unenumerated electrical machinery (£32,188). The three items of the telegraph and telephone cable and material section all recorded rises and as a whole were about £54,000 above the July total. Insulated wires and cables showed the greatest increase in the miscellaneous group, the other alterations being of minor consequence. The comparison with August, 1926, shows several considerable variations from the July comparison. For instance, there was an increase of £52,634 in unenumerated machinery and a decline of £79,212 in telegraph and telephone instruments and apparatus. Insulated wires and cables showed a large decrease (£35,895), but the increases predominated, prominent among them being the above-mentioned rise in unenumerated machinery, £47,086 in the case of "other motors and generators," £43,585 in batteries and accumulators, £36,745 in non-submarine, and £30,165 in submarine telegraph and telephone wire and cables. For the completed portion of the year the satisfactory increase of £1,309,254 is recorded.

The following table shows the distribution of electrical machinery exports during last month, as compared with the exports for August, 1926:—

Destination.	Aug., 1926. £	Aug., 1927. £	Inc. or dec. £
European countries ...	100,066	88,446	−11,620
Japan	25,518	17,854	− 7,664
South America ...	25,279	43,265	+17,986
South Africa	43,150	112,286	+69,136
British India	96,688	83,730	−12,958
Australia	80,197	91,146	+10,949
New Zealand	16,360	52,056	+35,696
Canada	12,735	6,576	− 6,159
Other countries ...	62,419	57,679	− 4,740
Totals ...	462,412	553,038	+90,626

The import total was about £20,000 lower than that of the previous month, the increases and decreases being fairly evenly balanced. The largest variation was a fall of £39,336 in unenumerated electrical machinery—nearly 30 per cent. Batteries and accumulators showed the greatest rise (£15,519); glow lamps fell by £10,236, or 25 per cent. In comparison with the corresponding month of last year there was a rise of £60,676 in imports, only two items, carbons and switchboards, showing smaller figures. The increase was fairly general, only unenumerated electrical goods and machinery being prominent with rises of £14,349 and £18,570 respectively. It will be seen that during the first eight months of the year electrical imports rose by £541,126 above the total for January-August, 1926. There was again nothing noteworthy in the re-export section, which decreased in both comparisons and thus brought the eight-month total still further below the 1926 level.

	Exports. Electrical exports for Aug., 1927.	Inc. or dec. as compared with July, 1927.	Inc. or dec. as compared with Aug., 1926.	Imports. Electrical imports for Aug., 1927.	Inc. or dec. as compared with July, 1927.	Inc. or dec. as compared with Aug., 1926.	Re-Exports. Electrical re-exports for Aug., 1927.	Inc. or dec. as compared with July, 1927.	Inc. or dec. as compared with Aug., 1926.
Electrical goods and apparatus (unenumerated)	£171,085	+ £6,037	+ £23,426	£100,543	− £614	+ £14,349	£4,214	− £513	− £659
Insulated wires and cables ...	232,278	+ 17,297	− 35,895	53,542	+ 2,162	+ 8,878	572	− 52	− 903
Glow lamps	49,930	+ 7,442	+ 9,997	33,508	− 10,236	+ 2,953	798	− 1,148	− 285
Arc lamps and parts	480	− 612	− 247	3,896	− 66	+ 3,546	61	+ 60	− 154
Batteries and accumulators ...	117,867	− 1,901	+ 43,585	66,655	+ 15,519	+ 8,983	139	− 842	− 71
Meters and instruments ...	36,091	+ 5,234	− 6,276	20,017	+ 1,787	+ 2,570	618	− 85	+ 470
Carbons	134	− 862	− 815	8,265	− 3,619	− 7,309	42	− 20	− 348
Electrical Machinery—									
Electrical machinery (unenumerated)	311,793	− 32,188	+ 52,634	95,412	− 39,326	+ 18,570	8,092	+ 2,460	− 1,986
Railway and tramway motors	22,598	− 5,015	− 9,094	—	—	—	—	—	—
Other motors and generators...	218,647	+ 46,829	+ 47,086	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	8,560	+ 4,584	+ 6,018	—	− 29	− 439	—	− 3	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	100,346	+ 25,460	+ 36,745	11,789	+ 6,870	+ 5,696	269	+ 109	+ 265
Submarine telegraph and telephone cable...	35,269	+ 2,082	+ 30,165	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	217,363	+ 26,541	− 79,212	32,619	+ 7,198	+ 2,879	2,283	− 679	− 103
Totals	£1,522,411	+ £100,928	+ £118,117	£126,246	− £20,054	+ £60,676	£17,121	− £713	− £3,174
Increases and decreases for eight months of 1927 ...		EXPORTS: + £1,309,254			IMPORTS: + £541,126			RE-EXPORTS: − £16,392	

Electrical Projects in Czecho-Slovakia.

We are informed that the Czecho-Slovak Ministry of Finance is seriously considering a fund for financing schemes for new water-power stations in connection with the big electrical projects which have been engaging the attention of the State engineers for some considerable time. Such a fund, it is stated, would be kept entirely apart from the ordinary Budget, and would be used exclusively for the purpose mentioned.

New Zealand and British Preference.

The Wellington correspondent of *The Times* says that an examination of the proposed New Zealand Customs tariff indicates a substantial increase of preference to Great Britain, as the principal remissions of duty on household articles, raw materials and plant have a preferential effect. The *Wellington Post* says that "the Government has ingeniously harmonised the interests of producers and consumers, manufacturers and importers, and benefited British trade without increasing the consumers' burdens."

The British Association.—III.

The 97th Annual Meeting, at Leeds.

SECTION G (Engineering) on September 6th had a busy morning, although only one paper was directly concerned with electricity. This was by Mr. R. Borlase Matthews on "Transport on the Farm" (*vide* our issue of September 9th). The papers were again of a high order, but the meeting was poorly attended.

Another paper of some interest was one by Prof. W. T. David, who dealt with the efficiency of internal-combustion engines, and put forward two rather interesting and important points. The first was that the ideal efficiencies of internal-combustion engines calculated upon the basis of the generally accepted specific heat and dissociation data were too low, and the second was that the ideal efficiencies increased with the compression ratio at a rate not only greater than that indicated by the air standard, but also greater than that indicated by the ideal efficiency calculations based upon the usual specific heat data.

Another paper by Messrs. H. R. Lupton and J. W. H Gill discussed in considerable theoretical detail the design of low-lift axial flow and centrifugal pumps. An experimental axial flow pump designed by the authors has been installed at the new Ferrybridge power station of the Yorkshire Electric Power Co.

Section G was one of the few which held meetings on September 7th; three papers were presented, these dealing with reinforced concrete beams, low head conduits, and the whirling of shafts.

Section A (Mathematical and Physical Sciences) drew many crowded and, at times, overcrowded meetings to hear well-known men discourse upon problems of absorbing interest to physicists and chemists. Reference has already been made to one or two of the subjects dealt with, and interest also attaches to a paper on Tuesday, September 6th, by Prof. C. G. Barkla, F.R.S., on "The Coherence of X-rays and the J Phenomenon." Prof. Barkla described a series of investigations on a newly found property or method of action of X-rays, described as coherence.

An afternoon lecture on September 5th, before Section A, by Prof. R. Whiddington, F.R.S., also drew a crowded attendance, the subject being "Luminous Discharge in Rare Gases." The lecture was illustrated by means of electrical discharge demonstrations, and Prof Whiddington pointed out that so far it had not been possible to determine the distribution of energy in the electrons, but only the maximum energy. Two papers in Section J (Psychology) by Dr. G. H. Miles on "Time and Motion Study as Employed by the Industrial Psychologist," and by Mr. S. Wyatt on "Machine Speeds and Output," have a general industrial interest, and the former is briefly dealt with in this issue.

A feature of the whole of the meetings at Leeds this year has been the large number of visits to works. In most cases they were taken part in by considerable numbers, but, curiously enough, in Section G there was more than one reminder by the Local Secretary that those proposing to take part in the visits to works were very few. For instance, although the party which went on the full-day excursion on September 3rd, which included the Goole Docks, the Ferrybridge power station, and two collieries, was eventually made up to a reasonable number, at one time it seemed that it might almost be a fiasco. On the whole, the meetings were of a satisfactory nature, subject to the mild criticism we have indulged in, so far as Section G was concerned. The attendances were good and bad by turns, and there is room for the Sectional Committee to endeavour to take some steps to get the discussions better supported. The Committee of Section G this year is to be congratulated on having arranged a series of papers written by leading men in their particular branches, and at the same time having succeeded in covering a very wide range of engineering subjects, giving to the meetings a variety which has not always manifested itself in the past.

Development of the Jet-Wave Rectifier.

By JUL. HARTMANN.

(Abstract of a Paper read in Section G.—Engineering.)

THE jet-wave rectifier is a mechanical rectifier based on the principle of an invention which dates back to 1907. It has been practically developed in the Royal Technical College, and the Municipal Power Station of Copenhagen.

The essential part of the rectifier is a jet-wave-commutator, the main part of which is one or more wave-shaped mercury-jets. It has been the principal object of the work in question to develop a single-jet commutator of as high a capacity as possible, and also for the highest possible voltage or current. At the present time single-jet commutators for 30-40 kW at about 180 V d.c. have been developed. By means of three such commutators working in series, a 100-kW, 550-volt, six-phase rectifier was produced in the course of the research work. The efficiency of this rectifier, not including the transformer, was about 92 per cent. at maximum load. The

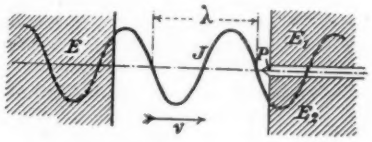


Fig. 1.—Principle of a Jet-wave Rectifier.

jet-wave commutator is subject to practically no wear. If the commutation in an ordinary mechanical commutator takes place too late, the spark is transformed into an arc which may cause considerable damage; the jet-wave commutator has been made practically free of this troublesome property.

The principle underlying the jet-wave rectifiers and commutators is illustrated in fig. 1. J designates a wave-shaped conductor of infinite length, which emerges continuously from the electrode E, and disappears into the double-electrode E_1, E_2, separated by means of an insulating wall P, lying along the axis of the conductor. If the velocity of the travelling conductor is adjusted in such a way that the conductor traverses a wave-length λ during the period of a given alternating voltage, the commutator may be used for the rectification of this voltage. It must be noted, however, that the double-

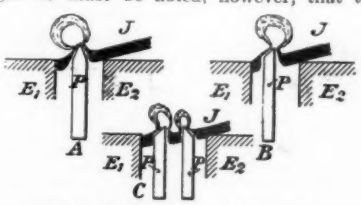


Fig. 2.—Development of Commutator.

electrode should be placed in such a position that the conductor is cut by P at the moment when the alternating voltage changes sign.

The waved conductor takes the form of a mercury-jet; this passes through a constant magnetic field. Through that part of the jet which at any moment is located within the field, an a.c. is transmitted. This current is led into and out of the jet through the jet-pipe and a special electrode. The interaction between the field and the alternating current produces a mechanical force, which gives the part of the jet which is just passing through the field a deviation from the original direction of movement. As the current varies periodically, the consecutive particles of the jet must obviously be emitted along a line oscillating to and fro like the rod of a pendulum. The jet-wave may be used for the commutation of any alternating voltage in phase with the current by which the wave is produced. The commutator is set up by inserting a double electrode into the path of the conductor so that the undeflected jet is directed against the edge of the separating wall, and by adjusting the electrode at such a distance from

the field that the bend of the jet is cut nearly simultaneously with the changing of the sign of the alternating voltage, which is to be rectified by the commutator in which the jet-wave will make connection with each of the two sides of the main electrode during one half period. The method of producing such a commutator is simply to raise the edge of the wall P. If a commutator for closing the connection during one-third of a half period is required, the edge should be raised $2/3 \times \lambda/2$ above the surface of the electrode.

By means of commutators such as those described above, practically all types of rectifiers may be constructed.

In the first solution of the commutator problem, the two sides of the double electrode were actually separated by a wall of insulating material, and the jet-wave was cut by the sharpened edge of the wall. It soon became apparent that the symmetrical grinding of the edge, fig. 2A, did not give the greatest exactness in the cutting. The asymmetrical form shown in fig. 2B was essentially better. From this, finally, the double-wall type, shown in fig. 2C, was developed. In the latter, the jet-band J is cut almost simultaneously by the two edges. This greatly increases the security of the commutation and, owing to the two commutation sparks, the commutation is effected in a shorter time than with a single cutting.

Fig. 3.—The Tungsten-Knife Commutator.

Many materials were tested with regard to their ability to withstand the effect of the commutation-spark; fused quartz, however, appears to be the only suitable material.

The quartz-wall commutator has now been abandoned on account of the far better qualities of the so-called tungsten-knife commutator. In the latter, the jet-wave is cut by a single knife of tungsten W, fig. 3, A and B. When the knife is made of a conducting material the spark will appear at the lower edge of the knife, away from the cutting edge, consequently, the latter will not be destroyed, while the corroding effect on the lower edges is more harmless because more material is available there. It has, however, been found necessary always to use combinations of two mutually insulated knives W_1, W_2, fig. 3C. Fig. 4 shows a practical form of a tungsten-knife commutator with a single knife. The two electrode-sides have been built up of wedges in order to avoid splashing of the mercury. The secondary electrodes have been furnished with cylindrical steel pieces along which an accidental arc will move away from the main parts of the electrode. The electrode was designed for, and used through long periods in, a 100-kW, 500-volt, three-jet rectifier. A simple device has been invented which completely solves the problem of stability in jet-wave commutators. The stabilisation device, fig. 5, consists solely of two insulated knives W_1 and W_2 introduced between the secondary electrodes e_1 and e_2 and the electrode sides E_1 and E_2. Almost simultaneously with the cutting of the jet-band by the knife W, the knife W_1, in the commutator will cut the band between E_1 and e_1, thereby introducing the left-hand resistance r which keeps the short-

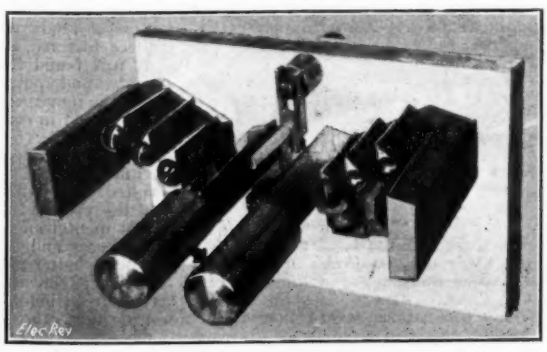


Fig. 4.—A Tungsten-Knife Commutator.

circuit current down to a harmless value. It was found that when a simple commutator was provided with the two knives W_1 and W_2, fig. 5, it could safely be worked in a position as low as 3 per cent. of a half-wave over the zero position, or even in that actual position. If kept in a position 10 per cent. over the zero point, an increase in frequency of at least 5 per cent. may be allowed in the case considered above. The commutator has therefore been made practically independent of frequency changes.

In its simplest form the rectifier can only be used in cases in which the direct current produced is kept practically constant. If, however, the field-magnet is provided with a compound winding carrying the rectified current and acting against the main windings, considerably larger variations in the current produced may be tolerated. Probably the rectified current may be reduced to 25 to 30 per cent. of its maximum value. By groups of commutators working in parallel the range of regulation can be made practically complete, the number of commutators in action being automatically reduced when the load is diminished.

Eventually the problem of current regulation was solved by providing an electrode each for the auxiliary current and rectified current, the electrode for the latter being adjusted as close to the commutator electrode as possible, in order to reduce the resistance of the commutator electrode.

One of the very first solutions of the auxiliary-electrode problem was the paring electrode, which consists of a knife

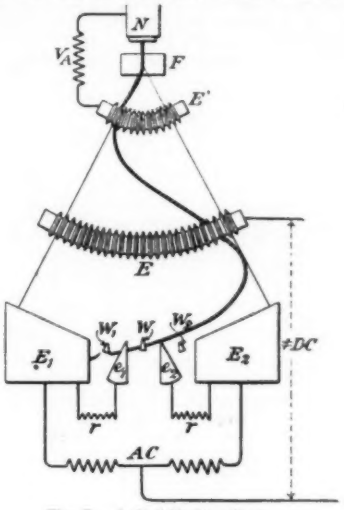


Fig. 5 —A Stabilisation Device.

with its edge parallel to the plane of the jet wave, and adjusted so that it takes a fine cut off the jet wave. Through this electrode fairly heavy currents may safely be passed into the jet wave. The paring electrode was used for years during the development of the rectifiers, but it has been replaced by the curry-comb electrode. This, as a rule, consists of two members separated by a distance a little less than the diameter of the jet, and adjusted so that the jet wave passes the intervening gap making contact with the ribs. The curry-comb electrode may be used for the transmission of still heavier currents than the paring electrode, and is more robust than the latter. The deformation caused by it does not, as a rule, influence the commutation sensibly. The contact resistance is about the same as with the paring electrode.

The paring electrode is only suitable for adjustment near the field, while the curry-comb electrode is adaptable for-

Fig. 6.—The Wedge Electrode.

greater distances. Currents up to at least 200 A can be passed through the electrode in stationary working. A quite different type of auxiliary electrode consists of a rather slender steel wedge placed in the middle plane of the commutator with the edge perpendicular to the plane of the jet wave. If the height of the wedge is greater than half the wave-length the wedge will be connected alternately for half a period with the two parts of the double electrode. The wedge electrode cannot be used as a joint electrode for the rectified and the auxiliary current, as contact with the wedge is not made by both parts of the band, fig. 6. The irregularities shown are practically smoothed out by surface tension, before the wave has travelled through half a wave-length.

A special adaptation of the jet-wave rectifier is the hydrodynamic circuit, in which the mercury, after having been utilised in the jet-wave, makes its way to a reservoir, from which a pump returns it to another reservoir feeding the jet-forming nozzle.

Commutation takes place in a closed chamber filled with hydrogen, or a mixture of hydrogen and an inert gas such as nitrogen. The effect of hydrogen is to absorb the energy of the commutation spark within a comparatively short time, say 10 times more rapidly than nitrogen or any other gas, except perhaps helium. The chamber is filled once for all with hydrogen, and need not be refilled unless it is opened for repairs or renewals of the working parts. During normal working, hydrogen is only needed to cover the exceedingly small loss due to inevitable leakages. The hydrogen is taken from a high-pressure cylinder. A constant excess pressure of, say, 5 to 10 cm. water gauge, must be maintained in the chamber.

Two types of chambers have been developed. In the earlier one the whole of the magnet was inside the commutation chamber, but later the coils, and the corresponding parts of the cores, were placed outside. The advantage of this is that a comparatively high temperature, say, 100 deg. C., may be allowed in the chamber, so that artificial cooling of the latter may, in many cases, be unnecessary; the arrangement with external coils has been generally adopted.

Super-Tension Cables.

(Discussion upon a paper read before Section G.—Engineering, by Mr. P. DUNSHEATH.)

Mr. W. B. WOODHOUSE (Yorkshire Electric Power Co.), opening the discussion upon this paper (which was abstracted in our last issue), said that the present state of the cable art was obviously unsatisfactory; the cable makers had been pressed forward perhaps rather too rapidly. As the result of oil-insulated paper as the dielectric for 11,000-volt cables proving so successful, everybody was encouraged to believe that the same dielectric would prove equally satisfactory for 33,000 volts. That had not been the case, and there were two outstanding points to be faced: the first was, had they reached the limit with the particular type of dielectric to which he had referred? Paper, either lightly or heavily impregnated with oil, had its definite limitations, and an illustration by the author of a 132,000-volt cable was an interesting reversion to a cable invented 50 years ago by Brooke, in which a cable was placed inside a pipe and was surrounded with certain matter to keep the cable from contact with the pipe, oil in this case being depended upon as the insulator. Oil, however, was not quite so satisfactory from this point of view as it might be, and perhaps a possible solution in the future would be to use a spongy material to hold the oil. This seemed the first problem to be tackled. The second was the limitation of the three-core type of cable. When the Hochstädter type of cable was first put forward some years ago it was almost generally condemned. It seemed to have dangers, and everybody was confident that although the tangential dielectric stresses were realised, they would not be very serious. To-day, however, he thought it could definitely be stated that with the present type of insulation they were getting near the limit with three-core cables. Speaking as a user, he was sorry to think that they would be forced to that limit for pressures such as 33,000 or 66,000 volts. A few years ago, they were much more concerned with potential gradients than the simple phenomenon of expansion under heat; perhaps one other line of research would be to find some means of reducing the relative difference of expansion between the conductor itself and its surrounding materials. The British cable makers stood in a class by themselves, and for that reason he was convinced they would find means to meet the present difficulties.

Prof. W. CRAMP (Birmingham University) said he liked the paper because it exhibited a candour which was not always forthcoming when a representative of a well-known firm of cable makers talked about their products. Reference was made in the paper to the necessity for linking-up overhead lines at 132,000 volts direct with underground cables with no transformer in between, but trouble was bound to occur in such circumstances unless great care was taken. The overhead line had very different constants as regards its oscillation frequency from those of the underground cable. It had a much larger inductance and a much smaller capacity, and therefore would naturally have across its ends, when a short-circuit occurred, a much higher potential difference than the underground cable. This point must not be overlooked, because the pressure in such circumstances was not limited to the 132,000 volts for which the cable was designed. This additional risk must be taken into account when dealing with the question of linking up overhead cables of the kind referred to with underground cables at 30,000 volts. The author rather suggested that the three-core cables now manufactured for 30,000 volts without any sheathing were satisfactory. The trouble was, however, that whilst for 22,000 volts this type of cable was entirely satisfactory, unaccountable breakdowns were taking place on cable working at from 30,000 to 33,000 volts. It seemed possible that the author's conclusions would require modification slightly, and that a limit of 30,000 volts should be fixed for three-core cables without sheathing and that for 66,000 volts and above, single-core cable armoured with non-magnetic material should be employed.

Mr. H. W. CLOTHIER (Reyrolle & Co.) said that much had been written on the question of intersheathed cables by Major A. M. Taylor, and he asked the author's views as to their prospects. With switchgear it was found that the condenser type of insulator which gave a more even distribution of dielectric stresses, was essential, and it might be useful in cable work. As to the reinforcing strands in the author's "S.L." cable, could they be used for remote control of a sub-station and automatic protection of cables? Were the strips of copper?

Mr. DUNSHEATH, replying to the discussion, pointed to the difference in the views expressed by Mr. Woodhouse and Prof. Cramp, and added that for the present he would place the limit at 33,000 volts for cables with the metal sheaths on either the S.L. or Hochstädter systems; the principle was the same in the two systems. The use of non-magnetic materials was a question of cost; there was no objection to them from the technical point of view. As to the reinforcing strands mentioned by Mr. Clothier, they were of steel, and they had been made as a separate armoured cable used for protection purposes or for remote control.

Time and Motion Study.

(Abstract of a paper by Dr. G. H. MILES *read before Section J—Psychology).*

The full title of this paper was "Time and Motion Study as Employed by the Industrial Psychologist." The author said that time study could be applied on the one hand to the mechanical side and on the other to the human side of industry, but there must be an entirely different standpoint in each case. The study of the human side of industry was the work of the trained physiologist and the psychologist and not of the engineer, but there was considerable room for co-operation between the psychologist and engineer. The psychologist was equally alive, with the engineer, to the importance of speed and accuracy and the economical needs of industry, but these factors must be attained with the help of, and not to the disadvantage of, the human factor. For example, a pause in an operation was, from a mechanical point of view, pure waste time and if occurring in a machine or process, the elimination of this unproductive time would directly increase efficiency. With the human being, however, a pause might serve an extremely useful purpose in giving rest to the worker, and though this elimination might be possible and would produce good immediate results, the long-period effect on health and constitution might prove disastrous. Undoubtedly the efficient engineer was often able to produce startling results by the device of setting a standard time for a series of operations and giving the worker a strong bonus incentive or using the fear of dismissal to induce him to reduce more and more such pauses and accomplish more work in a given time. Practices such as these, and the cutting of rates, had in the past made the workman very suspicious of time study, and there had been cases where the workman had deliberately "gone slow" when timed by a rate setter. Dr. Miles criticised the tendency on occasions for inexperienced people to endeavour to eliminate as unnecessary movements that were really necessary. A good illustration was an experiment in a large factory where the workers were engaged in polishing metal on revolving buffers. The workers exerted what appeared to be an extraordinary amount of effort in the process and seemed to be tiring themselves unnecessarily. A careful study was made of the movements, and they were reduced to three, but on putting the new method into practice it was found that the workers became tired much more quickly and output dropped due to the fact that in order to reduce the movements to three much more muscular effort had to be exerted in order to ensure sufficient pressure being put upon the article. There were many jobs in modern industry where it was quite conceivable that bodily movement had been reduced to such an extent that in the long run actual harm resulted. The author asserted that in some branches of industry at the present time an enormous amount of human, physical, and mental energy was wasted in the rigid mechanisation of processes and that there were immense economical possibilities in the better utilisation of man power for those who had the energy, foresight, and inventiveness to show the way. There were in industry many occupations where normal human activities must be largely restricted throughout the working day. Incentives in the form of high pay and bonuses would largely modify the reaction. When, however, a succession of irksome restrictions were added, when the worker was repeatedly "time studied," or allowed to work only in the "one best way," when, in other words, government from without began to dominate and the incentive of extra pay was reduced by a cutting or a tightening up of rates, a point was reached at which the reaction to restriction asserted itself with almost primitive force. Output gained by these methods was obtained at a terrible cost of human energy and happiness, and by replacing compulsion for co-operation we threatened the whole security of the industrial system. Dr. Miles, therefore, advocated a much wider use of time and motion study to help in the solution of problems which he said were far more important than the setting of rates of payment and in the end would produce not only results of far more lasting benefit, but would place on a more scientific plane our knowledge of the reactions of the worker to his environment.

The Shipping and Engineering Exhibition.

A Review of the Exhibits of Electrical Interest.

(Continued from page 485.)

Electric Welding Equipment.

The QUASI-ARC CO., LTD., is exhibiting a most comprehensive range of welding equipment and all the varieties of "Quasi-Arc" electrodes manufactured. The Type "S" single-welder motor-generator (fig. 9) is a feature of the exhibits.

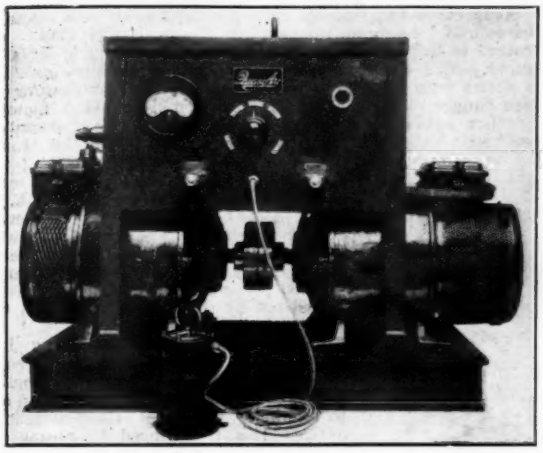


Fig. 9.—A "Quasi-Arc" Welding Outfit, Type "S."

It is suitable for d.c. working from a.c. or d.c. supply. It is very compact, self-contained with the necessary control switchgear, and capable of supplying current for all sizes of electrodes and classes of work. The set embodies the company's patent self-excited, self-stabilising welding generator. Apparatus for multiple-welder installations to work from low-voltage d.c. supply is also exhibited. Amongst the various a.c. and d.c. regulators shown for working on various voltages, type "A.C. 70" (oil-cooled) for working from 70-V a.c. supply deserves special comment on account of the property claimed for it of maintaining a wave-form of welding current to give correct welding conditions in spite

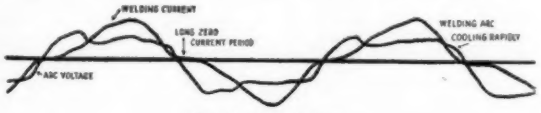


Fig. 10.—Oscillogram.

of the strong wave-distorting action of the electric arc. This is clearly indicated in oscillograms, figs. 10 and 11. A very compact portable 10/12-h.p. petrol generating set suitable for outside work or where no electrical or mechanical power is available is also on view. A unique feature of this set is that it is fitted with a patent electro-mechanical governor

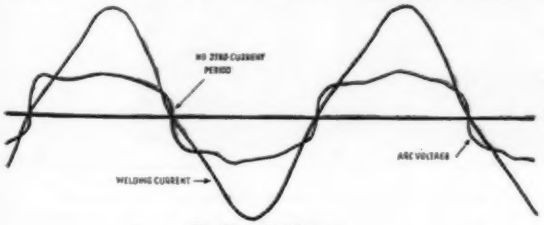


Fig. 11.—Oscillogram.

which, while exceedingly simple, responds instantaneously, it is claimed, to the demand upon the engine within a wide range, and also with the most delicate adjustment to the power required. Thus, in addition to mechanical speed regulation, the "Quasi-Arc" governor provides for any sudden demand made by the welding generator for increased power. Another exhibit which is attracting considerable interest is the new "Quasi-Arc" single-welder rotary transformer. This equipment is suitable for use on polyphase supply systems, and is capable of transforming not only the voltage, but also the phases, frequency and wave-form of the supply to the requirements of the welding circuit.

"Quasi-Arc" electrodes in their various sizes and types are also exhibited, together with examples of constructional work welded with these electrodes, including many types of welded joints and forms of construction such as are used in ships, bridge girders, oil tanks, and so forth. Many interesting photographs are displayed of views of some of the largest and most important all-welded structures which have been carried out at home and abroad within the last few years by the use of "Quasi-Arc" electrodes.

An interesting development to be seen on the stand of the PREMIER ELECTRIC WELDING CO., LTD., is the "Flexin"

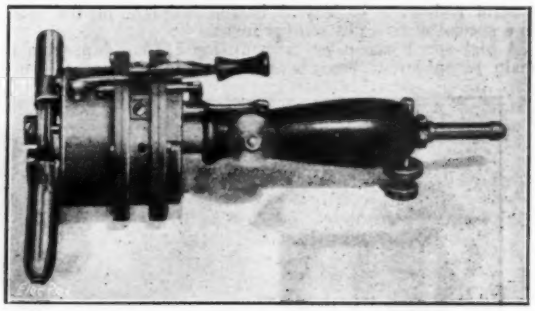


Fig. 12.—The "Flexin" Electric Welding Tool.

welding tool, fig. 12. This employs a continuous flexible electrode, fully fluxed and wound on a special drum, which is fed to the arc by means of the tool, either electrically or pneumatically. The tool is of a convenient size for one-hand operation. It is claimed that very high speeds of welding are possible on this system, and that all wastage due to discarded electrode ends is eliminated.

The ANGLO-SWEDISH ELECTRIC WELDING CO., LTD., is showing a range of electric-welding sets of somewhat unusual design. The generator, fig. 13, is self-regulating, and is

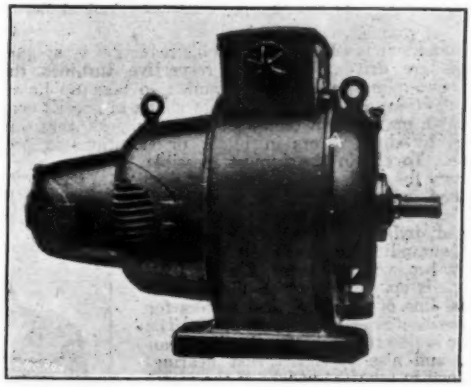


Fig. 13.—An "Anglo-Swedish" Welding Generator.

claimed to be extremely reliable and efficient. A feature of this equipment is that no instruments or switchgear are employed; all the regulation is carried out by means of a single hand wheel, by means of which the correct arc voltage for any type or size of electrode within the generator's capacity is obtained. Resistance or reactance in series with the arc is avoided. The whole is enclosed as shown, but ample provision is made for ventilation. Four sizes are supplied, with capacities of 125, 175, 250, and 400 amperes.

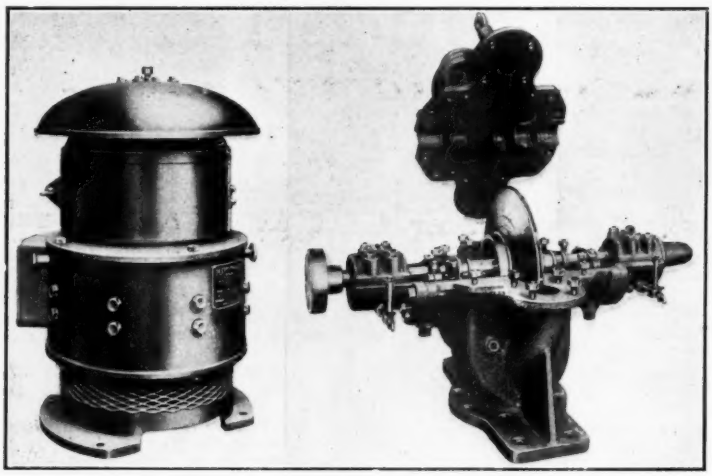
Motor-Driven Equipment.

Among the wide variety of exhibits of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., is a 4-in. diameter horizontally split casing condensate pump, fig. 15, which is capable of dealing with 250 gal. of condensate per minute. The pump will discharge against heads of up to about 140 ft., obviating the necessity of a separate lift pump in installations where the discharge head is high. Exceptionally large air-freeing chambers are incorporated on the suction side of the pump, in which any air rises vertically in its natural direction and is drawn away by the air pump. Air leakage along the shaft is completely prevented by large pressure chambers placed round the shaft on either side of the suction chamber and

connected directly to the discharge side of the pump. Both inlet and discharge branches are arranged in the lower half of the case, and are not disturbed by lifting the top half of the casing.

A worm-driven winch, fig. 16, suitable for either cargo or passenger boats, is shown by the METROPOLITAN-VICKERS Co. It is equipped with a 23-h.p., 220-V, 400-r.p.m. motor specially designed for deck-mounting service. It is equipped with a self-contained totally-enclosed and watertight magnetic brake, capable of safely holding the full load suspended, fitted with a hand release lever so that the load on the hook can be negotiated should the supply be interrupted. The winch control is effected by means of an automatic contactor equipment specially designed for housing in the sidestand of the winch. This is operated by means of a single lever, and combines in one set of apparatus all the necessary control equipment. A special load relay is incorporated in the control gear, which enables the load on the hook to be dealt with expeditiously and enables the empty hook to be returned down the hold at up to 400 ft. per min. Mercury-type switches control the contactors. The motor-control resistance is located in the bedplate of the winch in a special water-tight compartment.

A high-speed pinion for transmitting 5,000 s. h.p. from the main propulsion turbines is an item of interest to be seen on this stand. It is of the rigid double-reduction type, and both pinions are driven from their respective turbines through flexible couplings to allow the pinion to take up its correct axial position, and through flexible shafts of special construction and material to damp out any shocks that may be caused by slight errors in pitch, or variations in propeller torque. To obtain the utmost possible accuracy the company has developed and patented a pinion-measuring machine which in commercial practice will, it is claimed, indicate errors in pitch of one ten-thousandth of an inch.



Figs. 14 and 15.—A "Metrovick" Vertical Motor and Condensate Pump.

A 20-h.p. vertical motor, 220 V, 1,200 r.p.m., is an exhibit which illustrates a special line of M.-V. vertical motors for driving centrifugal marine pumps. The motor is fitted with ball and roller bearings, and also special thrust bearings designed to take the weight of the motor armature and the thrust from the pump.

Messrs. REAVELL & Co., LTD., are showing a range of compressors. The smaller of these are electrically driven. Some larger ones are pneumatically operated, the necessary air being compressed electrically. An interesting machine on this stand is a sub-station cleaning set, which has been designed specially for the purpose of cleaning electrical machinery. In consists of a small rotary compressor directly attached to an electric motor The compressor is designed on the rotary principle, thus eliminating, it is claimed, all vibration. A suitable steel drum for carrying the necessary flexible hose and cable is mounted on the top of the motor, forming a very neat and compact unit.

A very wide range of electrical apparatus is shown by Messrs. LAURENCE, SCOTT & Co., LTD., including electric steering gear, various types of ships' motors and winches, and automatic control equipment. One interesting item is a standard splash-proof and drip-proof motor. This ventilated motor is specially designed for ships' engine-rooms; it has no sheet-iron covers, all being of strong cast-iron. Both the inlet and outlet ventilation ports point downwards and are well below the centre line of the machine. The driving-end bracket is split so as to facilitate examination without having to disconnect the motor from the auxiliary machine. The bearing housings are separate. All the electrical connections inside the machine are either of brass, or, if made of steel, are zinc-plated. The laminated poles can be removed from the machine without disturbing the armature. The terminal boxes are of extra large size, with strong cast-iron drip-proof covers. An "E.M." totally-enclosed motor for use in fume-laden atmospheres is also to be seen on this stand.

Amongst a wide variety of apparatus on show by the SUNDERLAND FORGE & ENGINEERING Co. is a worm-geared ship's cargo winch capable of lifting 5 tons at 90, 3 tons at 120, or 1½ tons at 300 ft. per minute. It is driven by a watertight type motor capable of developing 45 h.p. at 275 r.p.m. The winch has a centre barrel, two warp ends, hand- and foot-operated brakes. A contactor-type control gear, suitable for mounting in the deck-house and for controlling the above winch is also shown, as are a number of generating sets, fittings, &c.

Some excellent examples of heavy machinery with electric drives may be seen on the stand of Messrs. HENRY PELS. A feature of this equipment is a 200-ton press suitable for all-round purposes, such as multiple punching and shearing. It is shown with suitable punching tools for the manufacture of pipe flanges. The machine is belt driven by a 10-h.p. motor. Another exhibit is a heavy-duty scrap and plate shearing machine. This will deal with 1¼-in. plates, 14-in. by 1¼-in. flats, and 3-in. rounds. It has a 24-in. gap, 20-in. shear blades placed on the skew. This is also belt driven, a 15-h.p. M.-V. motor being employed. It is evident that increased preference is shown nowadays for the belt drive for this class of machinery. It is interesting to note that 80 per cent. of the machines now turned out by this firm are intended to be electrically driven.

An interesting machine shown by Messrs. BULL MOTORS, LTD., is a repulsion induction motor, 220 V, single-phase, 50 cycles, specially designed so as to eliminate the usual short-circuiting device. This is arranged by means of two sets of slots in the armature, top and bottom, the top slots containing a short-circuited winding. It is claimed that this machine has an overload capacity of 100 per cent., and a starting capacity of 1.25 times the full-load torque with twice the full-load current.

Switchgear.

A selection of electric switchgear exhibited by the IGRANIC ELECTRIC Co., LTD., is extensive, and includes a "Varispede" pillar-type control panel for variable speed d.c. motors, a reversing drum controller, suitable for both a.c. and d.c. supply systems, particularly for cranes and travelling gantries, and other motor-control equipment. A very interesting exhibit on this stand is a working model of the Igranic newspaper-conveyor, a large number of which have been recently installed at the new printing office of the *Daily Mail*. Another piece of apparatus shown is a 19-in. type M brake which has been adopted by a large number of shipbuilding and engineering works throughout the world. A "Dean" valve control attached to a 12-in. valve is shown on this stand. By means of this apparatus the entire control of a gas, water or steam system, however large and diffuse, can, it is claimed, be centralised on a single control panel within easy reach of the operating engineer or station superintendent.

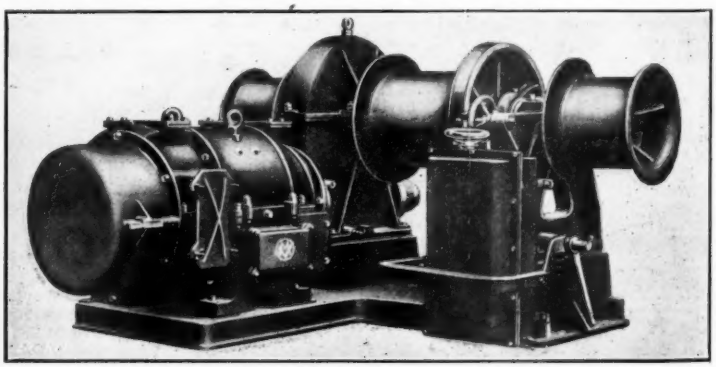


Fig. 16.—A Ship's Worm-driven Electric Winch.

The HACKBRIDGE ELECTRIC CONSTRUCTION Co., LTD., is showing, amongst other apparatus, an example of its automatic voltage regulating equipment, fig. 17, for feeders under load.

In order to avoid the expense of e.h.p. switchgear for the regulation, use is made of a method employing shunt and series transformers, the former being provided with tappings,

which are selected by the regulating switchgear. The pressure across the selected portion of the shunt transformer is conveyed to the lines through the series transformers. The contactors on the panel on show are suitable for a working pressure of 660 V, and are designed to carry 100 A, the total boost being 200 kVA, which may be applied positively or negatively by means of reversing contactors which enable the current from the shunt transformer to flow through the series transformers in either direction. The change-over from one tapping to another is effected without opening the circuit, as two adjacent contactors may be closed at the same time, a short circuit being avoided by the use of intermittently rated choking coils, each fitted with a mid-point tapping.

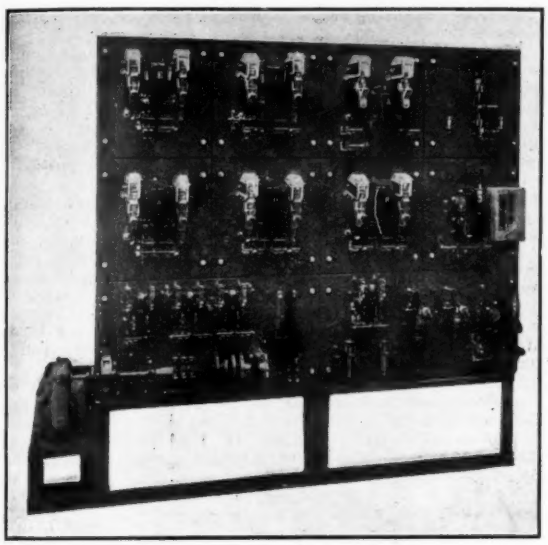


Fig. 17.—"Hackbridge" Voltage Regulating Equipment.

When tap changing is not in progress, each coil is short-circuited by one pole of a stepping contactor.

The operating coils of the contactors are connected to a suitable supply through the segments on the drum shown in the bottom right-hand corner of the panel, fig. 17. Above this drum will be seen the "Raise" and "Lower" push buttons which control the motor which rotates the drum. The push button control could be designed for remote operation, say at a distant sub-station.

The time of operation from one step to the completion of the next step is six seconds. The panel could be adapted for automatic operation by the addition of a voltage relay which would be connected to the line through a small potential transformer. The regulation is carried out by means of a tapped transformer which is connected to the switch panel. The switches are all of the contactor type, and the equipment is specially designed with a view to accessibility. The operating features of this type of equipment are a very high efficiency, and the elimination of any power factor variation or phase displacement on the secondary side of the equipment.

Communication Equipment.

A representative display of radio equipment is to be seen on the stand of Messrs. S. G. BROWN, LTD., including new models of receiving sets and loud speakers. Foremost amongst these is the "Sphinx." Other instruments are the "Universal," an instrument of similar character to the disk, but with a polished mahogany cabinet and a metal grille in place of an all-metal housing, the "Mascot," the "Crystaframe," a frame aerial crystal set, and so on. Power loud-speakers and instruments for the "Brown" public-address system are also shown.

Several interesting items of wireless apparatus are exhibited by the MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD. Perhaps the most interesting of these is the auto-alarm apparatus (ELECTRICAL REVIEW, August 26th, 1927), which has been designed to respond to the alarm signal when the wireless operator of a ship is off watch and so to recall him to the wireless room. Another piece of new apparatus is the Marconi 1½-kW c.w.-i.c.w. transmitter type MC6. This set works on wave-lengths of from 600 to 850 metres and from 2,000 to 2,700 metres, to cover which wave-lengths it was formerly necessary to use two transmitters. It is a valve transmitter operating on continuous waves and interrupted continuous waves. A ¼-kW telephone installation for small ships which do not carry a skilled wireless operator is attracting considerable attention. This is of very robust construction, and is completely enclosed; only three controls are required for operating the instrument, and are placed outside the case. A ¼-kW cabinet telegraph set is another interesting feature; it is so arranged that when power is available from the ship's dynamos it is operated at a power of a ¼ kW, but when power is not available from the ship's dynamos it can be operated from a 30-V battery in such a way as fully to comply with all Government regulations as to emergency transmitters. There is shown also a new pattern emergency wireless transmitter which complies with all Government requirements with a large factor of safety, although requiring not more than 10 A from an emergency battery for its operation. The Radio Communication Co., Ltd., is also showing auto-alarm apparatus (see ELEC. REV., August 26th, 1927), in addition to a comprehensive range of marine radio-telegraph equipment.

Several interesting radio-apparatus exhibits are to be seen on the stand of Messrs. SIEMENS BROS. & CO., LTD. One of the items is a ¼-kW wireless telegraph station, fig. 18. This is operated from a small motor-generator, which in turn

Fig. 18.—"Siemens" Radio-telegraph Outfit.

is fed from a 50-V battery. The current is led through a transformer to the excitation circuit, which consists of inductances, condenser, and quenched-spark gap. An aerial variometer is provided for tuning the aerial circuit. The receiver consists of a single-valve and crystal instrument with separate tuner covering all standard commercial wave-lengths of both spark and continuous-wave transmission. A regenerative reflex circuit is employed so as to obtain maximum amplification on the valve. The whole of this apparatus is contained in a comparatively small cabinet, which can be completed closed when not in use.

Some loud-speaking marine-type telephones are also to be seen on this stand. These instruments are of a specially robust and neat design for marine purposes. The special method of connection employed enables loud-speaking to be attained with a very small current, thus eliminating various sources of

Fig. 19.—A Marine Telephone for Noisy Situations.

trouble. The absence of conglomeration of the carbon granules in the transmitter, due to the smallness of current, permits of speech being carried on for an indefinite time without loss of loudness or clearness. The simplicity of the instruments and their connections is a great advantage, in that there are fewer parts to get out of order and fewer points where leakage may take place. Fig. 19 shows a side-tube type instrument for use in noisy situations.

(To be continued.)

The Institution of Public Lighting Engineers.

Annual Conference, at Brighton.

THE Institution of Public Lighting Engineers held its annual conference this year at Brighton, from September 12th to 15th, under the presidency of Mr. A. C. Cramb (borough electrical engineer and general manager, Corporation Electricity Department, Croydon). By the courtesy of the Corporation of Brighton, the meetings were held in the Music Room at the Royal Pavilion; the Corn Exchange, in the Pavilion grounds, was utilised for the exhibition of public lighting appliances, which is an established feature at the Institution's annual meetings, and at which a number of the principal manufacturers exhibited.

The exhibition was opened on Monday evening, September 12th, by the Deputy Mayor of Brighton (Councillor J. Lord Thompson, J.P.), who, in the absence of the Mayor (Councillor Richard Major, J.P.) from the town, received the members and delegates. Councillor H. J. Galliers (chairman) and other members of the Lighting Committee at Brighton, as well as Mr. John Christie (borough electrical engineer) were also present.

On Tuesday morning the Deputy Mayor extended a cordial welcome to the members and delegates, on behalf of the Mayor. He said that the object of the present conference was an inspiring one, and expressed the hope that the meeting would be successful in every way.

Mr. R. DAVISON (retiring president), who proposed a vote of thanks to the Deputy Mayor, pointed out how important it was that public lighting engineers, in carrying out their work, should have the civic chiefs with them.

The HON. SECRETARY (Mr. W. J. Liberty) announced that the total membership of the Institution stood at 138, some 25 new members having been elected since the last meeting.

The report of progress on the Articles of Association and by-laws was received and adopted, and the Council was empowered by resolution to proceed with the completion of the Articles, which will provide, among other things, for a change of name to the "Association" of Public Lighting Engineers.

Mr. A. C. CRAMB then read his presidential address, of which an abstract follows:—

Presidential Address.

By ALEX. C. CRAMB, M.I.E.E.

(Abstract.)

This Institution is of very recent birth, but it has scope for doing much useful work in the interests of the public. We have been told on authority that there has been very little improvement in the standard of our street lighting since 1914. When one considers the great progress that has been made in other directions in the last ten or twelve years, this fully justifies the formation of the Institution.

There seems to be two schools of thought with regard to street lighting, those who consider expenditure on street lighting a waste of money, and those enthusiasts who do not pay due regard to the economic aspect of the question. The proper course lies between the two extremes. The rapid increase in mechanically propelled fast traffic has changed the whole aspect of road transport and to the motor owner, as well as to the public generally, illumination is equally as important as the construction of roads, and it should be one of the duties of the Institution to see that the Ministry of Transport is kept fully cognisant with this aspect of the question.

The work of the National Illumination Committee at home, in conjunction with the British Engineering Standards Association, has resulted in a very useful document, *viz.*, the B.E.S.A. "Standard Specification for Street Lighting." In my opinion the improvement aimed at in this specification is much to be applauded, but I feel that there has been rather a tendency to emphasise a standard of illumination much in excess of the existing best lighted thoroughfares in the country. What I consider to be of real importance is to improve the enormous mileage of less important thoroughfares throughout the country.

It is important that there should be no sudden change in the degree of illumination on entering from one thoroughfare to another, but that the illumination should be graded so as to avoid accidents from such sudden change. It appears to me that there is a great deal of work to be done by the Institution in connection with the evolution of the most efficient type of fitting for various classes of thoroughfares. The cost of illumination of all thoroughfares in which there is any considerable road traffic should be contributed from two sources. The local authority should properly provide for the reasonable illumination of its thoroughfares, and this should be supplemented by a proportion of the funds subscribed by the motor owners through taxation.

The illumination of thoroughfares seems such an important matter that it should come under proper centralised expert control. It seems an elementary principle that there should be standardisation of not only the degree, but also the efficiency of illumination in thoroughfares, and that this should not be subject to the violent interruptions which mark the boundaries of neighbouring local authorities. The variation in illumination is not confined to sections of streets in the areas of different authorities, but occurs even in the area of any individual authority, probably owing to lack of co-ordination between the different departments.

The principal objective of the street lighting engineer should be that of efficiency. That this can be accomplished to a large extent by the use of suitable modern reflecting or refracting devices is proved by the following figures, which have been obtained by tests taken under actual service conditions in the various classes of Croydon's thoroughfares. In the main road the expenditure of 300 watts per standard gives an intensity of 300 candle-power directly below the light source and, by means of plain mirror reflectors, the available candle-power at the mid-span point is increased to over 2,000. With 200-watt fittings the corresponding figures are 200 and 1,300 candle-power respectively, while in the side streets single 75-watt lamps give an available 540 candle-power for mid-span illumination. The use of these or similar devices tends to level up the degree of illumination, thereby reducing the ratio of maximum to minimum, and at the same time a much higher average illumination is obtainable for a given expenditure of energy.

There is another direction in which the Institution may do much valuable work and assist the Ministry of Transport, and that is in the design and regulation of the various illumination signs for traffic control. It is to be hoped that by tackling this problem in the early stages, and by giving careful consideration to the most effective and efficient designs, with full regard to their artistic appearance, the thoroughfares of this country will not be further disfigured.

Mr. C. S. SHAPLEY (Leeds), proposing a vote of thanks, commented on the President's remarks as to the lack of progress in the matter of public lighting. Both Leeds and Glasgow, he said, had published reports on the progress of lighting in those cities, in which they had stated that since 1914 the efficiency of street lighting there had increased enormously.

The PRESIDENT, responding, agreed that in a few districts there had been improvement; but in the bulk of villages and towns up and down the country there had been very little progress.

A hearty vote of thanks was accorded Mr. Davison for his valuable services as president during the past year, after which the joint descriptive paper on the British Engineering Standards Association's draft "Standard Specification for Street Lighting," by Messrs. Jolley, Waldram and Watson, was introduced by Mr. Jolley, and a discussion followed.

The members and delegates were entertained at luncheon in the Banqueting Hall at the Royal Pavilion by the chairman and directors of the Brighton and Hove General Gas Co., Mr. A. M. Paddon (chairman of the company) presiding.

The CHAIRMAN, proposing the the toast of "Our Civic Authorities," and extending a hearty welcome to the guests, said he did not suppose that this visit would have been either practicable or possible thirty years ago, for at that time the different elements constituting that gathering were at sharp antagonism with each other. To-day those present realised that they could prosecute their respective enterprises without damaging each other and without injuring the public, each being a complement to the other. On those lines they might hope to progress, to their mutual benefit.

The DEPUTY MAYOR OF BRIGHTON, responding, paid a tribute to the officials of the Gas Company and to Mr. J. Christie, borough electrical engineer, who had the full confidence of the Council.

The MAYOR OF CROYDON (Councillor A. J. Camden Field, J.P.) proposed "The Institution of Public Lighting Engineers," and congratulated the members upon electing to the office of president so good a man as Mr. Cramb, for whom Croydon had a great regard. Mr. Cramb's public service in Croydon extended over some 25 years, and during that time, under his guidance, the Corporation's Electricity Department had made continued progress.

The PRESIDENT, in his response, expressed thanks to the chairman and directors of the Brighton and Hove General Gas Co. for their hospitality. One interesting aspect of the Institution, he said, was that it brought together two bodies of men who were in strong competition one with the other. Engineers in gas and electricity undertakings helped each other to effect economies, thus improving the efficiency of both services in the interests of the public.

In the afternoon the members and delegates visited the Brighton Corporation electricity works and the works of the Brighton and Hove General Gas Co.

(To be concluded.)

B.E.S.A. Street Lighting Specification.

By L. B. W. JOLLEY, M.A. (Cantab.), M.I.E.E., J. M. WALDRAM, B.Sc., A.C.G.I., and R. WATSON.

(Abstract.)

The genesis of the British Engineering Standards Association's specification for street lighting may be found in the work of the British National Illumination Committee, which suggested that the British Engineering Standards Association should add to its various committees one for the establishment of specifications for instruments and appliances used for illumination purposes. The B.E.S.A. gave favourable consideration to the request, and in 1924 established a sectional committee for the purposes outlined. This committee had its first meeting in June of that year, and appointed, among others, a sub-committee to deal with street lighting.

The draft specification now under consideration is, so far as British practice is concerned, the second of its kind. In 1913 "Standard Clauses for Inclusion in a Specification of Street Lighting" were drawn up by a committee of representatives of the various engineering institutions. The present specification is necessarily in advance of the 1913 one, and provides standards and conditions which may not only suit existing street-lighting requirements, but also so far as is possible anticipate what may be reasonably expected in the near future. It was issued in draft form for general discussion, and it received sympathetic support in principle and helpful criticism in detail. The criticisms have been carefully considered, and amendments made which will probably render the revised specification generally acceptable.

Generally speaking, the effect of increasing the spacing-height ratio is to decrease the minimum illumination and to

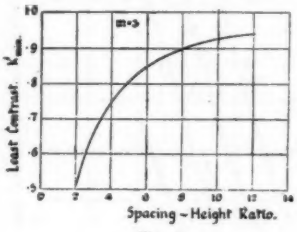


Fig. 1.

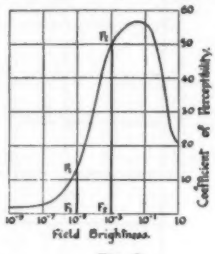


Fig. 2.

increase the diversity. If the height remains fixed, the maximum illumination is unaffected. "The intensity of illumination," expressed in foot-candles, is applied in several ways in the definitions in the specification. If e_m is the horizontal illumination at a test-point, it is apparent that owing to fortuitous circumstances, such as variations in supply pressure, manufacturing tolerances in the lighting unit, and the like, e_m will not be the same for all test-points, and that a more accurate measure will be the definitional horizontal mean test-point illumination E_M, which is the average of the horizontal illuminations at five test-points.

It should be noted that in the case of a symmetric distribution of luminous intensity, *i.e.*, a circular solid polar curve about a vertical axis, the horizontal illumination at a test-point e_m will be approximately the minimum horizontal illumination E_{min} in a span, if the definitional test-point is accepted. Assume, therefore, that is equal to the minimum horizontal illumination E_{min} and to the illumination at any one test-point e_m.

There are many who would press for the inclusion in the specification of a measure of the average illumination E_{av}. Theoretically the suggestion may be a sound one, but the practical difficulties of ascertaining even an approximate value of E_{av} by measurement in the street are considerable. Out of the illumination factors which enter into each street lighting installation, the Committee picked on the horizontal mean test-point illumination E_M not as a criterion of excellence, but as a method of classifying installations. The Committee would have liked to have correlated the classifications A, B, C, &c., with grades of thoroughfare, but this was found to be practically impossible.

The next factor in order of importance is that of the height of the light source above the ground level. From the point of view of glare it will be agreed that the higher the source of light the less the glare to the eye: but, on the other hand, the illumination varies inversely as the square of the height, and thus a compromise has to be effected. A table of heights has been included as a mandatory condition of the specification, which, with present information, represents the limits which may be considered reasonable.

The spacing-height ratio, more than any other single factor, determines the distribution of illumination on the road. The effect of a large value of the spacing-height ratio is to produce a low minimum and a high diversity, and generally necessitates the employment of directive equipment giving a high value of luminous intensity at an angle just below the horizontal. Under these conditions the proper maintenance of the apparatus is difficult, as careful focussing of the light source is required.

An object of brightness of B_0 candles per sq. in. will become apparent as it is seen against the light and dark patches on the road which have brightnesses of B_{max} and B_{min} respectively. Objects generally appear dark on a light background; but if the object happens to be so illuminated that its brightness is just intermediate between those of the light and the dark patches, then the contrast which it presents will be a minimum. For the value of the contrast, $K_{min}=(B_{max}-B_0)/B_{max}$ and $(B_0-B_{min})/B_0$ for the light and dark patches respectively.

The minimum contrast $K_{min}=(B_{max}-B_0)/B_{max}$. Since an object is more readily visible as the contrast which it presents is greater, this indicates at once the important influence of diversity on the visibility in the street, *viz.*, the greater the diversity the greater the minimum contrast, and therefore the visibility under the most adverse conditions.

In the specification the only obligation with regard to spacing-height ratio is that it shall not exceed a given value, and it will be seen from fig. 1 that on this basis there is little gain by an extension of the value beyond 12. It must be borne in mind, however, that if the ratio r is increased, then, to obtain the same illumination, increased luminous intensity will be required per fitting; further, an increase in r tends to too much glare.

The effect of a glaring source on visibility is a question which has engaged the minds of many in this country and abroad, but so far it has not been possible to reduce it to a matter of facts and figures. Glare is only dangerous in so far as it is deleterious to vision. The man in the street knows what he means by glare, but the specification considers something which is only one aspect of glare, *viz.*, its deleterious effect on ocular sensitivity.

In fig. 2 the relation between perceptibility and field brightness is shown, where the range of field brightness in street-lighting practice is in the region of F_1 F_2. If a glaring source

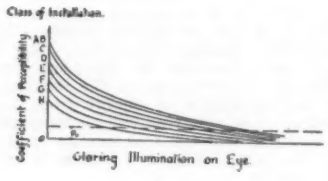


Fig. 3.

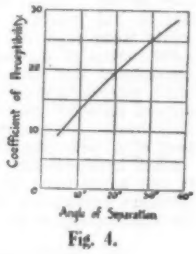


Fig. 4.

is introduced into the field so as to produce an illumination on the eye, the perceptibility is decreased in accordance with the curves given in fig. 3 where the initial ordinates OA, OB, &c., represent the perceptibility for the various classes of installation under a condition of no glare. As the curves are followed to the right from the points A, B, C, &c., the perceptibility becomes less and the light source becomes more glaring as the illumination on the eye increases.

The other factor which enters into the problem is the angle at which the incident light reaches the eye: in fig. 4 the relation between this factor and the perceptibility is shown. The method employed in the specification is to calculate for every installation the perceptibility of the observer anywhere in the span.

The problem of glare is by no means settled from the viewpoint of fundamental experiment. Work along these lines is in progress at the National Physical Laboratory. At the same time more practical road tests are being undertaken to ascertain how far the actual street measurements confirm the fundamental investigation.

The Annual Dinner.

The annual dinner was held in the Royal Pavilion on September 13th, with the new president, Mr. Alex. C. Cramb, M.I.E.E., in the chair.

Following the loyal toast, Councillor ANTHONY OATES, late Lord Mayor, Newcastle-on-Tyne, proposed "The Institution of Public Lighting Engineers." He congratulated Mr. Cramb on his induction to the presidency; he had that sympathetic touch necessary to overcome difficulties. He hoped that the harmony and goodwill within the Institution would continue.

Mr. R. DAVISON, the past-president, in replying to the toast, asked for the assistance of lighting committees. An extra 1d. rate for street lighting did not matter; the money was more than spent in meeting the costs of accidents, &c., which could be avoided by better street lighting. The lighting rate of 4½d. in Newcastle was not nearly enough.

"The Corporation of Brighton" was proposed by the Mayor of Bournemouth. He congratulated Brighton on its past progress, and on its enterprising plans for the future.

Councillor J. LORD THOMPSON, Deputy Mayor of Brighton, in reply, said that his town did all it could to invite such conferences as the one in question to be held there. Brighton had acquired a new area five times that of the old one; this they were going to develop.

Councillor H. J. GALLIERS, chairman, Brighton Electricity Committee, proposed "The Visitors," and the toast was supported by Mr. S. B. Langlands, the first president of the Institution.

In reply, Mr. H. D. MADDEN, M.Inst.C.E., president of the Institution of Gas Engineers, said that the presence at the

Conference of the representatives of the great engineering institutions indicated that those bodies were aware of the importance of public street lighting. He had been struck by the fine exhibition of street-lighting apparatus, and also by the hospitality extended to the visitors by the municipality and the electricity and gas undertakings.

Mr. H. DICKINSON, M.Inst.C.E., chief engineer of the Liverpool electricity undertaking, proposed "The President, the I.P.L.E.," saying that Mr. Cramb had a charming personality, a valuable possession for a president. He was also possessed of tact, and had had great experience in the running of associations, which would prove of enormous value to the young institution. Mr. Cramb had in Croydon some splendid examples of street-lighting.

In reply Mr. CRAMB suitably thanked Mr. Dickinson.

Russian Electrical Notes.

(By Our Special Correspondent.)

Leningrad Electricity Supply.

THE experts who have investigated the cause of the recent breakdown in the cable ring in Leningrad, causing an interruption in the supply from the hydro-electric station on the Volkoff, have reached the conclusion that it was due to bad jointing. During the erection of the station 200 joints were replaced, and it was also necessary to cut out 1,500 metres of damaged cable. It is considered necessary to reconstruct the cable ring at a cost of 330,000 roubles, the work extending over two years. Another report states that a sum of 2,000,000 roubles is to be expended by the Leningrad Elektrotok (Electricity Supply Undertaking) on the construction of a new ring line for the supply of energy from the Volkoff hydro-election station. The new ring will be composed of two aerial lines, one of which will transmit energy to the southern sub-station at a pressure of 100,000 V, where it will be transformed down to 6,000 V.

Machine Construction in Leningrad.

The works of the Elektrosil, Leningrad, is stated to have on order 43 turbo-generators of a total capacity of 170,000 kW. The present output of two generators per month is to be increased to five in February next year. The time for delivery has now been reduced to twelve months and the prices of the generators have been lowered by 25 per cent.

The Leningrad Metallurgical Works has begun the construction of two 22,000-kW turbines for the Elektrotok, while the generators have been ordered from the Leningrad works of the Elektrosil. The largest turbines hitherto constructed by the former have been of 10,000 kW.

A New Peat Fuel Station.

It is reported from Leningrad that a group of local engineers is preparing a scheme for the construction of a large peat fuel station in the vicinity of that city, the capacity of the works being put at 120,000 kW.

Gaining Foreign Experience.

As a result of an agreement entered into between the State Electrical Trust and the German A.E.G. last year, some 70 engineers, managers and workmen were sent to the works of the A.E.G. to gain experience of the German methods of working. Some of these remained away for two months and others for six months, and a further batch is to proceed to Germany shortly. Moreover, other representatives were dispatched to the United States and France to become acquainted with the latest developments in the production of lamps and the equipment intended for the electrification of the oil districts.

Moscow Electrotechnical Institute.

It has been decided to establish a general electrotechnical institute in Moscow, equipped with laboratories for electrochemistry, electro-metallurgy and electric traction. The institute is not to interfere with the activity of any existing scientific associations, but is to supplement the work of the latter.

The Donetz Basin.

The Supreme Council of National Economy has decided to form a committee in Kharkoff for the organisation of the administration of electrification in the coal basin of the Donetz. It is suggested that the electricity supply undertakings should be amalgamated under a single control and arrangements made to utilise inferior classes of coal and coke oven gas as fuel.

A Neva Hydro-Electric Project.

The scheme for the construction of a hydro-electric works on the Neva has been approved by the Electric Planning Commission as being practicable. The capacity of the station is to be 60,000 kW, and the outlay is estimated at 74,000,000 roubles.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

New Marconi and "Osram" Valves.

The MARCONIPHONE CO., LTD., has issued a new KH.1 valve, which is similar to its well-known KI.1 pattern, and is designed for operation off a.c. mains. It has a magnification factor of 40 and an impedance of 30,000 ohms, thus being suitable for use in high-frequency stages, as an anode-bend or cumulative-grid rectifier, and for the first low-frequency

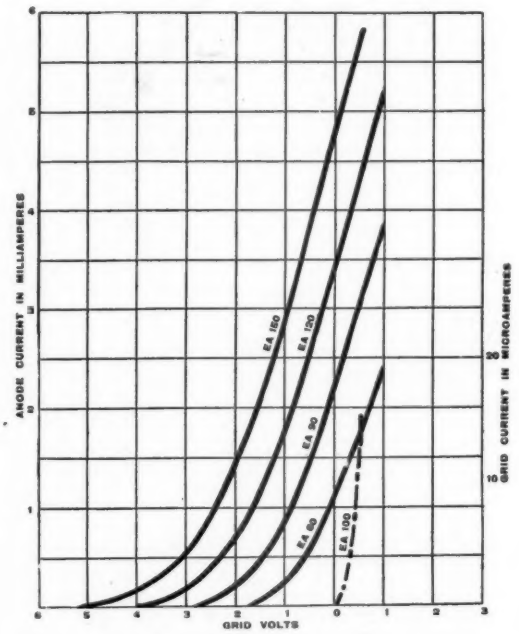


Fig. 1.—Characteristic Curves of KH.1 Valve for A.C. Mains.

position in a receiver, where it may be used with resistance-capacity coupling or with a good low-ratio transformer having a high primary impedance, such as the 2.7 to 1 "Ideal." In combination with the KL.1 valve, it should impart to the batteryless receiver high efficiency. Its characteristics (fig. 1) are: fil. volts, 3.5 max.; h.t. volts, 150 max.; fil. amps., 2 max.; and normal slope, 1.33 mA per volt.

An "Osram" valve similar to that described above is also marketed by the GENERAL ELECTRIC CO., LTD., and both companies are now supplying a new two-volt DEP.240 pattern, which is comparable in power output with the well-known DE.5A type. With an anode voltage of 120 V the new valve requires from 12 to 16 volts grid bias, and this, combined with its very low impedance of 3,000 ohms, renders it particularly useful for operating cone and diaphragm loud speakers at full volume without distortion. The filament current has been increased to 0.4 amp., as below this value efficiency and reliability cannot be maintained with the comparatively high emission required; the extra consumption is, however, offset by the increase in power output, which enables the user of two-volt valves to compete with the six-volt devotee for purity and volume. The valve's amplification factor is 3.5 and its normal slope 1.16 mA per volt. It has been possible to produce such a valve by fitting it with a W-shaped filament of great length. It is possible for the new valve to deal with an imput grid-swing of approximately 30 volts, a figure which represents a powerful signal that might overload the ordinary type of power valve. The DEP.240 is intended for use in the last stage of a low-frequency amplifier having at least two or three stages.

"Efesca" Battery Eliminators.

The range of anode-battery eliminators marketed by MESSRS. FALK, STADELMANN & CO., LTD., comprises three types. Model 1 is contained in an oak case, the dimensions of which are 12 by 7 by 4.5 in., and provided with three positive tappings: one variable in 5-volt steps by a 7-point switch from 40 to 75 V for h.f. and detector valves, and two fixed at 90 and 120 V for l.f. and power valves; it also incorporates negative grid-biasing tapps at 2, 4, 6 and 8 V. The outfit is designed to operate off 250-V d.c. mains, but it will provide half the output voltages stated above when working off 110-V mains

Model 3 is similar, but it includes a full-wave rectifying valve for operating off a.c. mains.

Model 2 (fig. 2) is a d.c. pattern for feeding three valves or four if the total plate current does not exceed 25 mA. Contained in an oxidised copper casing 3¼ in. in diameter and 5 in. high, it has two fixed tappings for 60 and 120 volts, its special feature being the provision of a 6-V negative grid bias tap.

Fig. 2.—"Junior" Model 2 Battery Eliminator.

The "Minilux" Speaker.

We recently had a sample speaker sent us by ATTAIX, LTD., which is of handsome appearance and sold at a low price. Fig. 3 shows it to be of the hornless variety and diminutive in size, its overall height being only 5½ in. and diameter 3½ in. Although the volume it is capable of producing is not great, it is sufficient for a fair-sized room and reproduction (of music especially) is surprisingly good; in fact, it is one of the best speakers of its size we have heard. The resistance of the instrument is 2,000 ohms, and the good results obtained are said to be due entirely to the use of good-quality materials throughout its construction, with very strong magnets. The terminals are underneath, together with a control lever.

Fig. 3.—The "Minilux" Speaker.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1926.

4,473. "Electric hammers." Central Electric Tool Co. March 30th, 1925. (249,828.)

5,458. "Electrical switches." J. A. Crabtree. February 26th, 1926. (276,386.)

5,469. "Selecting mechanism for type-printing telegraphy and other purposes." T. J. Berryman. February 26th, 1926. (Addition to 249,177.) (276,387.)

10,440. "Apparatus for producing oscillations in electrical circuits." Ratheon Manufacturing Co. and C. G. Smith. April 20th, 1926. (276,398.)

10,557. "Picture telegraphy and the like." G. M. Wright, S. B. Smith, and N. E. Davis. April 21st, 1926. (276,399.)

10,916. "Electric batteries." R. M. Burlison and W. Dereham. April 26th, 1926. (276,404.)

12,537. "Wireless receiving apparatus." Birmingham Small Arms Co., Ltd., and F. W. Turrell. May 17th, 1926. (276,409.)

12,639. "Apparatus for analysing substances by means of Röntgen or cathode rays." F. Dessauer. May 15th, 1925. (Addition to 252,207.) (252,206.)

12,791. "Fixed contacts of electric switches." J. A. Crabtree. May 19th, 1926. (276,414.)

13,066. "Electrical transmission circuits." General Electric Co., Ltd., and A. C. Bartlett. May 21st, 1926. (276,419.)

13,152. "Alternating-current motors." Maatschappij Tot Vervaardiging Van Snijmachines Volgens Van Berkel's Patent En Van Andere Werktuigen. May 22nd, 1925. (252,401.)

13,166. "Alternating-current frequency changers." Dubilier Condenser Co. (1925), Ltd. May 22nd, 1925. (252,403.)

13,320. "Cooling and ventilation of dynamo-electric machines." C. W. Major and Crompton & Co., Ltd. May 28th, 1926. (276,433.)

13,606. "Telephone system." Standard Telephones & Cables, Ltd. (G. Deakin). May 26th, 1926. (276,442.)

13,870. "Rail joints for railways, tramways, and the like." F. Cooper. June 1st, 1926. (276,445.)

14,714. "Electric switches." L. J. Norton and S. Hansford. June 11th, 1926. (276,460.)

15,035. "Electrical resistances." Siemens Bros. & Co., Ltd., and L. G. Salmon. June 15th, 1926. (276,464.)

15,413. "Electric circuit interrupters." L. Mellersh-Jackson (M. H. Shoenberg). June 18th, 1926. (276,465.)

15,465. "Methods of and means for reproducing or recording sounds." N. Lea and Radio Communication Co., Ltd. June 19th, 1926. (276,466.)

15,589. "Electric rotary convertors." R. Townend, G. A. Juhlin, and Metropolitan Vickers Electrical Co., Ltd. June 21st, 1926. (276,467.)

15,597. "X-ray tubes." Dr. M. Liebermann (trading as C. H. F. Müller). September 18th, 1925. (258,549.)

15,938. "Receiving apparatus for electric oscillatory signals." Dr. F. Aigner. June 24th, 1925. (254,327.)

16,079. "Electrically or mechanically driven rotors for centrifugal apparatus, such as spinning cans for artificial silk." Naamlooze Vennootschap Ijzer fabrieken De Vijf. March 2nd, 1926. (267,076.)

16,691. "Arc discharge apparatus for regulating, rectifying, amplifying, or modifying the frequency of alternating currents." Soc. des Relais A. Arc. July 3rd, 1925. (254,746.)

17,069. "Thermionic valve circuits." P. L. Wostear and R. H. Billingsley. July 7th, 1926. (276,479.)

17,173. "Electric signalling systems." K. E. Wenzel. July 8th, 1926. (276,481.)

18,853. "Enclosed switches for polyphase current." Siemens-Schuckertwerke Ges. August 1st, 1925. (256,247.)

22,271. "Manufacture of condensers with variable capacity." C. Hollins. October 5th, 1926. (276,508.)

22,917. "Combination tool for the use of electricians, wireless workers, and others." C. H. Kitching. September 17th, 1926. (276,509.)

23,481. "Spring protectors for flexible conductors entering electrical apparatus." H. B. Jackson. September 23rd, 1926. (276,513.)

23,841. "Horns for sound reproducing and like instruments." H. J. Kuchenmeister. October 2nd, 1925. (259,207.)

24,092. "Winding of coils." Igranic Electric Co., Ltd., and P. W. Willans. September 29th, 1926. (276,515.)

24,407. "Ignition and other magnetos." F. H. Farrer and Villiers Engineering Co., Ltd. October 2nd, 1926. (276,516.)

24,744. "Radiation of electrical energy." Dr. A. Esau. October 7th, 1925. (259,579.)

24,853. "Electric drive mechanisms for calculating machines." Burroughs Adding Machine Co. January 29th, 1926. (Divided application on 265,122.) (265,135.)

27,929. "Automatic regulating transformer." G. Block. November 6th, 1926. (276,529.)

28,911. "Variable tuning condensers." E. G. Danielson. May 24th, 1926. (271,400.)

29,853. "Means for setting type-wheels of printing telegraphs and the like." Siemens & Halske Akt. Ges. May 31st, 1926. (271,809.)

30,859. "Electrical condensers in materials for dielectric purposes, and a process of preparing the material." British Thomson-Houston Co., Ltd. December 4th, 1925. (262,473.)

31,541. "Electric remote control systems." British Thomson-Houston Co., Ltd. December 29th, 1925. (263,784.)

1927.

543. "Television, picture transmission, telecinematography, and the like." Telefunken Ges. für Drahtlose Telegraphie. January 8th, 1926. (264,174.)

727. "Device for automatically disconnecting faulty conductors in electric mains." S. Schild. January 10th, 1927. (276,552.)

2,179. "Machines for winding or covering cables or the like with tape or strip material." F. Krupp Grusonwerk Akt. Ges. March 6th, 1926. (267,691.)

2,464. "Means for automatic parallel connection of synchronous alternating-current generators." E. Pearson. January 28th, 1926. (265,219.)

4,345. "Electromagnetic coupling device." Electro-Transmission. March 27th, 1926. (268,304.)

6,698. "Torold coils and process for the manufacture of same." Dubilier Condenser Co. (1925), Ltd. June 9th, 1926. (272,448.)

7,048. "Method of and apparatus for basing incandescent lamps and similar articles." British Thomson-Houston Co., Ltd. March 31st, 1926. (268,747.)

8,180. "Protective systems for electric transformers." Metropolitan-Vickers Electrical Co., Ltd. April 15th, 1926. (269,509.)

8,267. "Super-regenerative circuits for wireless receivers and the like." R. A. Clausnitzer. January 18th, 1927. (276,584.)

8,490. "Electricity meters." Allgemeine Elektricitäts Ges. April 1st, 1926. (268,777.)

8,665. "Electric hoists." M. Fleiner. April 28th, 1926. (270,264.)

8,936. "Telegraph circuits for duplex and quadruplex working." T. C. V. Nielsen. March 31st, 1927. (276,587.)

11,993. "Translation of electric variations into variations of light." Telefunken Ges. für Drahtlose Telegraphie. May 5th, 1926. (270,728.)

14,652. "Electric cables having a supported lead sheath." Siemens-Schuckertwerke Ges. June 25th, 1926. (273,266.)

14,823. "Electric discharge devices." British Thomson-Houston Co., Ltd. June 18th, 1926. (272,892.)

14,968. "Electric rotary convertors." R. Townend, G. A. Juhlen, and Metropolitan-Vickers Electrical Co., Ltd. June 21st, 1926. (Divided application on 276,467.) (276,603.)

15,261. "Protection of loading coils in submarine cables against pressure." International General Electric Co., Inc. June 8th, 1926. (272,513.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 14th :—

Protos. Nos. 478,901, 478,902, 478,903, 478,904, 478,905, 478,906, and 478,907. All goods in Classes 5, 7, 15, 16, 26, 27 and 40 respectively.—Siemens-Schuckertwerke Gesellschaft, Berlin. (British representatives: Haseltine, Lake & Co., 78, Southampton Buildings, Chancery Lane, W.C.2.)

Bryteco. No. 481,543 Class 13. Electric lamps (ordinary), electric switches, and electrical fittings.—Bryterlite Electrical Co., Ltd., 10, West Campbell Street, Glasgow.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Examination hall, &c., at King's College, Old Aberdeen (£30,000); the principal. Reconditioning of Woodend Hospital (£10,000); city architect.

ABERYSTWYTH.—Additional 50 houses, for the T.C.; borough surveyor.

ASHBURTON.—Extensions to Grammar School (£10,000), for the governors; clerk.

BATH.—Additional 122 houses, Southdown, for the T.C.; borough surveyor.

BIRKENHEAD.—Additions, Infirmary, Church Road; Board of Guardians. Shop and 9 houses, Bidston Estate; Birkenhead and District Co-operative Society.

BLACKPOOL.—Refuse destructor (£30,916), for the T.C.; borough engineer.

BOLSOVER.—Wiring houses for electric light, for the U.D.C.; T. B. Kenyon, clerk.

BRADFORD.—200 houses, direct labour, Shirley Manor Estate; city architect. Reconstruction 955-959, Thornton Road; Bradford Co-operative Society, Ltd. Central clinic, Manor Road; city engineer. Electric lighting, central fire station residences; Watch Committee.

BRECHIN.—Reconstruction of Brechin High School (£18,000) for Forfarshire Education Authority; the rector.

BRIDGWATER.—Alterations and additions, Town Hall and municipal offices; Samson & Colthurst, architects, 51, High Street.

BURNLEY.—Contemplated central school, Lockyer Avenue; borough surveyor.

CADISHEAD.—Additional housing scheme (40), for the U.D.C.; surveyor.

CAERPHILLY.—Extensions to Miners' Hospital (£30,700), for the governors; Griggs & Vaughan, architects, Newport, Mon.; Richard Jones, builder, St. Martin's Road.

CARLISLE.—Electrical installation, Newlands Farm, Carleton; R. Twaddle. 120 houses, Raffles Estate; John Laing and Son, Ltd. 40 houses, Botcherby Estate, and 64 houses, Raffles Estate; J. & R. Bell. Extensions, Holme Head Mills, for Ferguson Bros., woollen manufacturers.

CHEADLE (STAFFS.).—Extensions, including ballroom, 12 bedrooms, &c., Ash Hall Hotel, for James Grant.

CHESTERFIELD.—Warehouse, stabling and bacon washery, for the Co-operative Society; Wilcockson & Cutts, architects, 12, Saltergate.

CLAYTON (YORKS.).—Extension of nurses' home at the Institution for North Bierley Union; Ross & Briggs, architects, Eldon Chambers, 75a, Manningham Lane, Bradford.

COVENTRY.—Greyhound racing track, Binley, for the International Greyhound Racing Co. (Coventry), Ltd.; S. J. Oldham, architect, Masonic Hall.

CROYDON.—Two schools (£23,115), for the Borough E.C.; director of education.

DEAL.—Additional 20 houses, Golf Road, for the T.C.; T. C. Golder, architect, Neville House, Queen Street.

DOUGLAS (ISLE OF MAN).—Motor-'bus station, for Manxland Services, Ltd.; H. Oldfield, architect, Workington, Cumberland.

DUNDEE.—Church at Craigiebank for Church of Scotland; clerk of Presbytery.

DURHAM.—Banqueting hall, Rose and Crown Hotel, for Councillor Wood. Concert hall, Sunderland Road, for J. W. Oates.

FARNBOROUGH (HANTS).—Assembly rooms, Alexandra Road, for T. H. Jones.

FOLKESTONE.—Houses (23), for the T.C.; East Kent Building Co., builders.

HECKMONDWIKE.—Extensions, Flush Carpet Mills, for T. F. Firth & Sons, Ltd.

INDIA (BOMBAY).—Enlargement, Municipal Market, Elphinstone Street; Municipal Commissioner.

IRISH FREE STATE (KILLARNEY, Co. KERRY).—Technical school for the County Education Committee; M. Hannan, Listowel.

KING'S LYNN.—Majestic Cinema and ballroom; J. L. Carnell and W. Dymoke White, joint architects, Paradise Chambers.

LANARKSHIRE.—Two schools for Roman Catholic Church, costing £34,000 and £50,000; priest-in-charge, Motherwell. Nurses' home at Hartwood for Lanark District Board of Control; J. Lochhead, architect, 115, Cadzow Street, Hamilton.

LEEK.—Dyeworks and factory, Cheddleton Road, for Joshua Wardle & Sons, silk manufacturers.

LONDON (E.).—Shops and flats, New Street, Middlesex Street; city engineer.

(CATFORD, S.E.).—Dispensary and welfare centre, Catford Hill; Lewisham borough engineer. 20 houses, Hengrave Road; Wm. Wilmot, Ltd. Salvation Army hall, Bromley Road; O. Archer.

(DOWNHAM, S.E.).—325 houses, L.C.C. Estate; L.C.C. architect.

(LEWISHAM, S.E.).—Buildings, site of 67-71, High Street; Royal Arsenal Co-operative Society. 26 houses, Newquay Road; T. A. Boughton.

(SHOREDITCH, E.).—Reconstruction railway station; L.M.S. Rly.

(WEST HAM, E.).—Remodelling Upton Cross Schools (£9,282), for the Borough E.C.; education architect. Additional 100 flats, Manor Road, for the T.C.; borough surveyor.

LUTON.—Development of Warden Hill Estate for houses; Manning & Steel, architects. Additional 20 houses, Leagrave, for the R.D.C.; surveyor.

MALVERN.—Technical School of Art, for the Higher E.C.; Henry Rowe & Son, architects, Worcester; Brazier and Sons, builders.

MANCHESTER.—Housing scheme (1,144), Ladybarn, for the C.C.; borough engineer.

MARGATE.—Extensions, including ballroom, St. George's Hotel, Eastern Esplanade, for P. Levett.

OLDHAM.—Operating theatre, Westhulme Hospital, for the T.C.; borough engineer.

PORTSLADE (SUSSEX).—Housing scheme (36), for the U.D.C.; surveyor.

PORTSMOUTH.—Greyhound racing track, for a local syndicate; Brig.-Gen. Critchley. Extensions, Nursing Home, St. Andrew's Road; Victoria Nursing Association. Bank, Milton Road, Copnor; Lloyd's Bank, Ltd. Factory extensions, 116, High Street; W. H. Barrell, Ltd. 24 garages, off Granada Road; Haig Motor Co., Ltd. Billiard hall, off Highland Road; F. J. Privett.

PRESTWICH.—71 houses, Corporation estates; L. O. Jurgens, Old Trafford.

QUEENBOROUGH.—Central school, for Kent E.C.; W. H. Robinson, education architect, Sessions House, Maidstone.

READING.—Greyhound racing track, Whitley Hill, for the Reading Greyhound Racing Co., Ltd.

SALFORD.—Re-housing scheme, Pendleton (76), for the T.C.; borough engineer.

SHEFFIELD.—Church, &c. (£15,500), for the trustees of Carver Street Wesleyan Church.

STOKE-ON-TRENT.—Additional housing scheme (56), for the T.C.; borough surveyor. Houses (44), for the T.C.; C. Cornes & Son, builders, Hanley.

TROWBRIDGE.—Block of offices, Stallard Street, for the Wiltshire Working Men's Conservative Benefit Society; Lander & Tanner, architects, 22, Surrey Street, Strand, London, W.C.2.

WAKEFIELD.—Market shops, City Market; Drake and Warters. Police station, fire station, and firemen's dwellings, Westgate; city engineer. Isolation hospital, Snapethorpe; city engineer.

WALLINGFORD.—Additional 40 to 50 houses, for the R.D.C.; surveyor.

WALSALL.—Additional housing scheme (75), Four Crosses site, Leamore, for the T.C.; borough engineer.

WHITBY.—Proposed extension of the Spa Orchestral Hall and sewerage scheme; J. R. Seward, surveyor to the Council.

WIGAN.—Greyhound racing track, for the Northern Greyhound Racers (Wigan), Ltd.; H. F. Keighley, architect, 8, Manor Road, Blackpool.

WOKING.—Extensions, Nursing Home, The Grove; Mrs. Pasfield.

WOLVERHAMPTON.—Greyhound racing track, Monmore Green, for the Midland Greyhound Racing Co., Ltd.; Fred Williams, Goldthorn House.